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FOR ASIA AND THE FAR EAST

REPORT OF THE SEMINAR ON ENGINEERING AND TRAFFIC ASPECTS OF HIGHWAY SAFETY

BANGKOK, 1958

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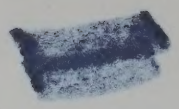

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INTRODUCTION

1. The Seminar on Engineering and Traffic Aspects of Highway Safety was held in Tokyo, Japan, from 13 to 23 May 1957, in pursuance of a recommendation by the Highway Sub-Committee at its third session, in November 1955. The resolution was endorsed by the Inland Transport Committee at its fifth session, in January 1956, and approved by the Economic Commission for Asia and the Far East (ECAFE) at its twelfth session, in February 1956.

Attendance

2. Representatives of the following member and associate member countries attended the Seminar: Burma Republic of China, Hong Kong, India, Indonesia, Japan, Republic of Korea, the Philippines, the Union of Soviet Socialist Republics and the United States of America.

3. Also participating were representatives of Keamanan Lalu-Lintas (Indonesia), Ikatan Perusahaan-Perusahaan Otobis Seluruh Indonesia (IPPOSI), the Japan Highway Public Corporation, the Overseas Construction Association of Japan, the Japan Roads Association and the Japan Automobile Chamber of Commerce and Industry.

4. A list of participants is reproduced as annex I of the present report.

Opening addresses

5. On behalf of Mr. C. V. Narasimhan, Executive Secretary of ECAFE, Mr. M. S. AHMAD, Chief of the Transport Division of the ECAFE secretariat, welcomed the experts attending the Seminar. He noted that it was the second time that a seminar of this nature had been organized under ECAFE auspices, to bring together experts from the region and outside countries to discuss specific urgent problems facing the region as a whole, and to attempt to devise solutions for them. The ECAFE region had shared in the phenomenal growth of motor transport which had characterized the postwar decade, but, unlike in certain other areas, fast-moving mechanically propelled cars and trucks had not completely displaced slow-moving animal drawn vehicles. The problem of safe highway transport in the ECAFE region was, therefore, more complicated than in many other parts of the world. To illustrate the magnitude of the problem, he quoted figures on the increase in population and the number of motor vehicles, the rate of accidents in various cities, the number of deaths and injuries and the financial losses resulting therefrom.

6. He particularly called attention to the need for educating drivers and pedestrians, for adopting and enforcing uniform traffic regulations and for establishing training centres. Inadequate repair and maintenance facilities, substandard work, shortage of trained personnel, and scanty mechanical knowledge and experience on the part of drivers had contributed to increase the hazards of motor traffic.

7. In conclusion, he expressed the gratitude of the Executive Secretary to the Japanese Government for offering facilities in Tokyo for the Seminar. The modern transport system of this great metropolitan centre was an ideal field laboratory for studying urban traffic problems, and the experts would no doubt avail themselves fully of the opportunities offered. He expressed his thanks to the specialized agencies of the United Nations for their invaluable contribution to the work of the Seminar in the form of technical papers and the attendance of experts.

8. Mr. K. OZAWA, Parliamentary Vice-Minister of Construction, conveyed to participants in the Seminar the warm welcome of the Japanese Government and its pledge of full co-operation. He recalled that the necessity for a seminar on highway safety had been recognized as early as 1953, and he was gratified that Tokyo had been chosen as the venue. The great amount of preparatory work that had been done redounded to the credit of the ECAFE secretariat.

9. He noted the remarkable postwar growth of road transport in Japan; this had brought in its wake traffic congestion and accidents. Better and safer highways were needed for the country's expanding economy, and the Government was directing its earnest efforts to that end. It was his impression that the entire ECAFE region was facing similar difficulties. A study of highway engineering and safety problems by an international body of highly qualified experts could not have been undertaken at a more timely moment.

10. He had no doubt that the deliberations of the Seminar would result in valuable recommendations. He wished the experts the greatest success in their work and expressed the hope that they would find their sojourn in Japan both profitable and enjoyable.

11. The experts unanimously adopted a vote of thanks to the Government of Japan for the facilities provided for the Seminar.

Election of the Chairman and Vice-Chairmen

12. Mr. M. Yoneda (Japan) was unanimously elected Chairman. Mr. L. D. Wylie (United States of America) and Mr. M. M. Chudasama (India) were unanimously

elected first Vice-Chairman and second Vice-Chairman respectively.

Adoption of the agenda

13. The provisional agenda, which had been prepared by the ECAFE secretariat, was adopted; it is reproduced as annex II of the present report. The members of the Seminar discussed an additional item, a regional study week of traffic engineering. Discussion of this subject is covered in section VIII of the present report.

Consideration of agenda items

14. The Seminar had before it two reports which had been prepared by the ECAFE secretariat for the discussion: "Engineering Aspects of Highway Safety" (E/CN.11/TRANS/Sub.2/26, 28 May 1954); and "Traffic Aspects of Highway Safety" (TRANS/Sub./2/1, 15 November 1955). To supplement these two documents, governments of the region had been requested to send the secretariat pertinent information on the relevant questions, in particular on such points as administrative structure, enforcement of traffic laws, traffic control, design standards for various types of road, forecasting of future traffic, cost-benefit analysis and safety education. Documents available to the Seminar are listed in annex III of the present report. Films from Australia and the United States on highway safety were shown.

15. After a general discussion, it was decided to set up four working parties, constituted as follows and assigned the following agenda items:

Working Party A:

I. Administrative structure and distribution of traffic safety responsibilities.

VII. Training, education and public information regarding traffic safety.

Chairman, Mr. L. D. Wylie; members: Mr. N. Amanullah, Mr. E. Djajanegara, M. Ohsawa, Mr. Y. Park, Mr. E. de los Santos, Mr. J. G. Simpson, Mr. H. Yamaguchi and Mr. Y. Zien.

Working Party B:

II. Prediction of future increases in traffic and vehicle registration.

VI. Economic aspects of traffic design and operation.

Chairman, Mr. R. Maslog; members: Mr. K. Fujimori, Mr. K. Han, Mr. N. F. Horoshilov, Mr. N. Katahira, Mr. A. N. Mamin, Mr. N. Okuda, Mr T. K. Ong, Mr. I. S. Ramos and Mr. R. Slamet.

Working Party C:

III. Accident facts and their uses.

V. Traffic operation.

Chairman, Mr. A. Morrison; members: Mr. K. Iwasaki, Mr. U. Margono, Mr. T. Nakahara, Mr. R. Tanaka and Mr. P. Y. Woo.

Working Party D:

IV. Capacity of roads and intersections.

Chairman, Mr. T. Yoshida; members: Mr. M. M. Chudasama, Mr. K. Hoshino, Mr. H. S. Kwee, Mr. T. Takano and Mr. C. M. Wang.

16. The reports which were prepared by the four working parties were modified in the light of the general discussion and were adopted for incorporation in the main report.

17. The scope of the Seminar was wide, since safety and the flow of traffic, which are closely interrelated, depend upon a number of technical, economic and social factors as well as upon administrative conditions. In considering the subject, the experts discussed three major aspects of highway safety: engineering, enforcement and education. The present report summarizes the discussion of the agenda items and contains the views, suggestions and recommendations of the Seminar on various factors which affect traffic safety.

Closure of the session

18. The experts indicated their deep appreciation of arrangements made by the Government of Japan for the Seminar and expressed their gratitude for the hospitality extended during their stay in Tokyo.

19. They further expressed the opinion that the Seminar, which had included tours of inspection, had had very great informative value.

20. The Committee adopted a vote of thanks to the Chairman, the two Vice-Chairmen and the Chairmen of the working parties.

I. ADMINISTRATIVE STRUCTURE AND DISTRIBUTION OF TRAFFIC SAFETY RESPONSIBILITIES

A. Administrative organizations dealing with highway safety

21. All administrative organizations dealing with highway traffic are concerned, to some extent, with highway safety. According to the functions performed, they fall into the following categories: road engineering, such as design and construction; traffic planning and research; promulgation of traffic laws and ordinances; administration of traffic regulation, including vehicle registration and issuance of driving licences; traffic law enforcement.

(1) Road engineering agencies

22. This category includes agencies that deal with road construction, improvement and maintenance. Upon the advice and request of traffic planning and research organizations, they also deal with such matters as the installation of traffic signs, signals and markings, traffic islands. These are functions usually undertaken by civil engineers.

23. The functions of these road agencies may be summarized as follows:

(i) Design, survey and construction of roads, bridges, culverts, and tunnels;

(ii) Improvement, upon suggestions of traffic planning and research agencies, of existing roads, bridges, culverts and tunnels;

(iii) Maintenance of existing roads, bridges, culverts and tunnels to ensure that they are kept in good condition and accessible to all types of vehicular traffic;

(iv) Installation, upon recommendations of traffic planning and research organizations, of necessary traffic signs, markings, signal and islands that facilitate the flow of vehicular traffic; and

(v) Budgeting and accounting of road revenues and expenditures called for by road construction, improvement and maintenance.

24. The engineering work on roads, bridges, culverts and tunnels may be carried out at different levels of government organization. In some cases, interstate or interprovincial roads (also commonly called national roads) are the responsibility of the central government, while in others they may be entrusted to state, provincial or local governments under the supervision of the central government. Roads within state or provincial boundaries are built, improved and maintained by the provincial governments concerned; in many cases, they may be classified into state, provincial, municipal and country roads dealt with by respective local governments.

25. Where responsibility for the improvement and maintenance of provincial or prefectural roads rests with local governments, financial assistance to such local governments from the central government may be provided in such amounts and for such purposes as may be prescribed by national laws.

26. Funds for road construction, improvement and maintenance usually come from taxes on motor fuels, vehicles and road users, although governments frequently cover insufficiencies in funds from other revenue sources. Differences of opinion may arise as to the justification for deriving all road revenue from taxes levied exclusively on road users, since many other people benefit from road construction and improvement. In the ECAFE region, where the number of motor vehicles is comparatively small, taxes collected from vehicle and road users are far from sufficient to meet the costs of the necessary improvements. Governments in the region should therefore endeavour to secure additional funds from their general revenues for such improvements.

(2) Traffic planning and research agencies

27. A government organization dealing with traffic should contain a special division or department whose function is to collect and study traffic data, and to draw up plans and suggestions for road improvement. Such a body is usually called a Planning and Research Division, upon which the attainment of maximum traffic safety will largely depend.

28. There should be an adequate staff of traffic engineers and experts to undertake planning and research traffic along the following lines:

(i) Transportation research, including statistics relating to movements of vehicles as well as to passengers and property;

(ii) Operating research, including traffic counts, design of traffic signs, markings and signals; and

(iii) Accident research, including the collection of complete information on each accident, and analysis of the circumstances, causes, time, location.

29. The compilation and analysis of traffic and accident statistics may be carried out with the assistance of various civic organizations, such as motor carriers' associations, insurance companies, automobile manufacturers' associations. The government departments concerned should do their best to encourage these organizations and to offer ideas and recommendations for the promotion for traffic safety.

30. Traffic engineers should consider suggestions from these sources and should concentrate their efforts on the improvement of road designs, and on traffic control and regulation with a view to meeting the pressing demands of vehicular traffic. The recommendations of the planning and research division should be given prior consideration by the road agencies.

(3) Traffic laws and ordinances agencies

31. It is of primary importance that traffic regulations and ordinances should be enacted, promulgated and enforced by the appropriate government body or bodies. Detailed studies of proposed laws and codes should be made prior to their enactment, and special emphasis should be laid on their practicability. Traffic experts as well as lawyers should devote their efforts towards making them as adaptable and enforceable as possible.

32. Laws and ordinances should be strictly observed by all organizations and citizens alike without exception or favouritism.

(4) Motor vehicle administration agencies

33. As part of the requirements imposed by law, registration of motor vehicles and licensing of drivers are generally carried out by a special government division or department. This organization is usually called the Motor Vehicle Department, and is provided with a sufficient number of regional offices to enable it to operate on a nation-wide or state-wide basis.

34. Rules and procedures pertaining to motor vehicle registration, transfer of ownership, issuance of certificates, permits or plates, and licensing of drivers are generally defined in the motor vehicle law or in special ordinances.

35. The purpose of registration is to ensure that all motor vehicles allowed on the road comply with the safety requirements prescribed by laws and ordinances. Thus, prior to their registration, vehicles should be inspected by officials of the motor vehicle department, and registration certificates and licence plates should be issued on evidence of satisfactory condition. A registration fee is usually collected to cover the cost of operating offices and inspection stations.

36. Some other formalities and controls may be instituted at the time of registration. For instance, in Japan, the law provides that third party liability insurance must be carried by the owner of a motor vehicle and no motor vehicle is allowed to operate unless a certificate of such insurance is isuued.

37. Registration should apply to all motor vehicles, including government-owned vehicles. It should be renewed periodically. A yearly basis is common. In Japan, however, the period varies from nine months for such vehicles as buses and taxis to twenty-four months for private passenger cars.

38. Another important function entrusted to the motor vehicle department is the issuance of driving licences. These licences are granted only to persons who are physically capable of safe driving; know the rules of road; and have proper driving experience.

39. Any person driving a motor vehicle, whether privately or government-owned, should possess a driver's licence. Qualifications for a driving licence and examination procedure should be set forth in the highway law or related ordinances. A different type of licence, requiring higher qualifications, should be issued for the operation of public vehicles. In some countries, as is the case in Hong Kong, a special driver's licence is required for an instructor in a driving school or for any person giving private driving lessons. It is important that a driver's licence should be renewed periodically. Three years is an accepted and desirable period.

40. In some countries, periodic inspection of motor vehicles is carried out under the supervision and control of the motor vehicle office or department. In Japan, inspection of vehicles by road transportation offices is compulsory before registration, or after the major repair of a vehicle. The same offices are authorized to issue licences to operators of vehicle repair shops in order to ensure that the maintenance and repair of motor vehicles is carried out by skilled and competent mechanics according to proper safety standards.

(5) Enforcement agencies

41. After traffic laws and ordinances have been enacted by the appropriate government agencies, it is necessary to enforce them. Enforcement is usually carried out by the police and judicial agencies.

42. No agency can deal with the enforcement of traffic laws more efficiently than the police; without a competent force of traffic police, laws and ordinances cannot be enforced strictly and effectively. Although there may be a need for special traffic police, they should form part of the regular police force in a single adminstration, co-ordinated with other police officers for the protection of life and property and the maintenace of law and order.

43. Traffic police are officers in the enforcement of traffic laws, not prosecutors. They should watch the traffic flow, but if they discover a violation of traffic laws, they should investigate the case and bring it to court for trial.

44. In countries where violations are frequent because of a heavy flow of vehicular traffic, separate traffic courts should be established to handle traffic cases. They are somewhat different from local or district courts, since they deal only with traffic violations. Such traffic courts can deal promptly with cases of traffic violations, since the judges have specialized experience in traffic rules and regulations, which district judges may not possess.

45. Some countries (India, Indonesia) have instituted a system of "moving honorary magistrates" to supplement enforcement action by the police in districts where traffic is heavy and violations relatively frequent. Such magistrates have the authority to judge and punish a traffic violator on the spot. This procedure appears applicable only to minor offences, but it has the advantage of reducing the number of cases brought to court. While it may have proved effective in India, the system might result in abuses elsewhere. The general opinion of the Seminar was that the practice was merely a palliative measure where police forces were insufficient in number, and that its use should be discouraged.

B. Police and court procedures in the enforcement of traffic laws and regulations

46. It was recognized that police and court functions and procedures relating to the enforcement of traffic laws and regulations necessarily differed from one country to another, because of variation in the provisions of laws enacted in different countries. Certain common objectives, however, might be set forth as desirable goals.

(1) Functions of the police

47. The policing organization should be efficient and impartial in apprehending violators of laws and regulations. The police organization may consist of:

(i) Stationary police posted at all important intersections in cities and towns, to direct vehicular and pedestrian traffic, to apprehend violators and to deter motorists and pedestrians from taking unnecessary risks;

(ii) Mobile foot patrols covering several blocks, to minimize violations at points other than intersections;

(iii) Motorcycle or automobile patrols, covering a wide area to apprehend speeding, reckless and other dangerous drivers;

(iv) Inspection forces, to make periodic spot checks at locations having special traffic problems or unusually high accident rates, to determine whether changes may be needed in the regulations affecting such areas.

(2) Recruitment of policing personnel

48. Great care should be taken to ensure that the right type of officer is recruited for policing duties. From the very beginning of their training, with the ideals of public servants, whose primary duty is to protect and serve the public, should be instilled into them. In their dealings with the public, their conduct should be beyond reproach: honest, considerate, impartial and polite, but firm in the performance their duties. They should be thoroughly familiar with all traffic laws, rules and regulations. They should be able to prepare accurate, complete and concise reports on all traffic cases and to give clear and correct evidence in court.

(3) Relations between the police and the court

49. Relations between the police and the court should be cordial and co-operative, for the better enforcement of the law. Traffic laws and regulations should provide a scale of penalties for specific offences, as is done in Hong Kong. This simplifies the work of both the police and the court.

50. In the case of serious accidents, a police officer or a special accident investigator should be sent to the scene of the accident to take photographs and measurements and to interview witnesses. After the investigation is completed, the case should be sent directly to the court, where the violator may be defended by a lawyer and prosecuted by a court prosecuting inspector or lawyer.[1] Police and court officers should pay special attention to persons frequently convicted of traffic violations.

51. The system at present applied in the Philippines for traffic enforcement is described here, not for adoption by countries of the region, but because it suggests a possible way of differentiating between minor and major offences.

52. In the Philippines, where the Chief of the Motor Vehicle Office, together with the National Police Force (Philippine Constabulary), is responsible for the enforcement of traffic laws, rules and regulations, violators are either taken directly to the courts of justice or are penalized administratively, depending on the gravity of the offence. Offenders are generally taken to court for violations of the law in cases where specific punishment is prescribed. The rules and regulations provide that, for certain violations, offenders may be given a warning; for others, their driving licences may be suspended for a number of days or revoked permanently, depending on the gravity of the offence. Any police officer, agent, inspector or the Deputy Chief of the Motor Vehicle Office may issue a warning to an offending driver, noting it on the driver's licence. A driver given four such warnings within a period of twelve months is considered an improper person to operate a motor vehicle, and his licence may be suspended by the Chief of the Motor Vehicle Office or his deputies for a period not exceeding three months. The driver may appeal against the decision of the police in such cases. Only the Chief of the Motor Vehicle Office or his duly authorized deputies may suspend a driver's licence.

53. When a police officer, agent or inspector apprehends a driver for violation of traffic law, the licence of the driver is confiscated by the officer if suspension of the licence is warranted under existing rules and regulations, and a provisional permit is issued to enable the driver to return to his home or office. The driver is given a form which notes the specific provision of the law or regulation violated, and advises him of the date on which he is to report to the nearest Motor Vehicle Office for investigation. In the

[1] See the paper entitled "Police and Court Procedures as related to Enforcement of Traffic Laws and Regulations" by George Larsen, Jr., Traffic Institute, Northwestern University, (Chicago, Illinios; mimeographed), which was made available to the Seminar.

case of serious violation of laws or regulations, the offending driver may be arrested on the spot and brought to court immediately.

54. Suspension or revocation of a driver's licence is an administrative measure with considerable impact on a motorist's attitude and behaviour; when properly used, it should have a marked effect on the safety of traffic. The motorist should of course be guaranteed an impartial decision.

C. Traffic laws and regulations

(1) Essential provisions

55. A basic requirement of a second and adequate highway safety programme in any country is a motor vehicle law which provides for the necessary authority and organization to control motor vehicles, drivers and pedestrians. The law should cover the following functions:[2]

(i) Registration and identification of motor vehicles;

(ii) Licensing of drivers (including examinations and tests);

(iii) Proof of financial responsibility of vehicle owners;

(iv) Requirements and procedures in reporting accidents;

(v) Adoption of rules of the road for drivers and pedestrians;

(vi) Requirements for vehicular equipment;

(vii) Periodic inspection of motor vehicles;

(viii) Limitations on the size and weight of motor vehicles;

(ix) Arrest procedures.

56. Motor vehicle laws enacted by the legislative body of a central, state or provincial government may be enforced throughout their respective jurisdictions. In smaller areas, such as municipalities, the legislative body may also enact regulations to control motor vehicles, drivers and pedestrians within their own jurisdiction. It is necessary, however, that regulations for the smaller jurisdictions should be in conformity with the laws of the state or province of which they are a part. Regulations enforced by cities in accordance with authorization from a state or province may include traffic control, restrictions on standing and parking by vehicles and the movements of pedestrians and bicycles, speed limits, requirements for accident reports and such other details as fall within the authority of the local administration.

57. All these functions are necessary and desirable components of a government's vehicle code. While there may be circumstances which make it impracticable or impossible to control these functions by law at a given time, continuing efforts should be made by officials of highway departments to secure their eventual inclusion.

(2) Promulgation and support of law

58. Responsibility for directing the formulation of proposed laws pertaining to the regulation of motor vehicles, drivers and pedestrians rests with administrators and officers of governmental departments in charge of the administration of highway improvement and utilization measures. Such departments should seek and consider advice, recommendations and support from all governmental and non-governmental organizations having an interest in motor vehicle regulation and control. Co-operation should be sought, in particular, from planning agencies, highway departments and police and motor vehicle administrators. The experience of officials of these organizations is useful in formulating vehicle codes, which should be based on experience rather than theory. Participation of such organizations in formulating motor vehicle laws helps to promote understanding and acceptance of the laws and leads to better and more uniform implementation and enforcement of provisions which may later be enacted into law.

59. Similarly, advice and co-operation should be sought from non-governmental organizations, including schools and colleges, manufacturers of motor vehicles and equipment, truck and bus transportation agencies, insurance companies, motor clubs, safety groups and other civic, legal, engineering, business and labour organizations. The co-operation of such organizations promotes public support, understanding and acceptance of the law.

60. In order to implement a programme, the necessary funds must be provided. Organizations which support the formulation and enactment of laws and ordinances may be of major assistance in securing favourable action by the legislature in providing funds to administer and enforce the provisions of the law.

61. In countries where local, provincial or state governments are responsible for the adoption of motor vehicle laws and ordinances, the central government should assist and advise the local units in preparing and formulating laws so that a maximum degree of uniformity among states, provinces and municipalities may be achieved. Laws and ordinances thus enacted should be reviewed periodically (say, every four or five years) to ensure that they cover all recent developments in traffic administration and enforcement procedures, and improvements in motor vehicles, highways and traffic control techniques.

(3) Uniformity

62. It appears impractical to adopt a uniform set of laws, rules and regulations on traffic safety for enforcement in all countries of the region, owing to differences in kind, width and length of roads, in the volume and kind of traffic, and in the customs and characteristics of the people. However, advantages may be derived from some degree of uniformity in traffic regulations; traffic confusion would be reduced and the task of traffic control and enforcement made

[2] Each of these functions is discussed briefly in a paper "Standards of Laws and Ordinances", prepared by M. T. Bustard of the National Committee on Uniform Traffic Laws and Ordinances, Washington, D.C., which was distributed at the Seminar. Copies of "Uniform Vehicle Code" and "Model Traffic Ordinance", prepared by this Committee were also distributed.

easier. Uniformity in regulations concerning motor vehicle equipment would undoubtedly result in increased safety. Similarly, uniformity should be achieved with respect to requirements for driving licences. The consensus of the Seminar was that uniformity in traffic rules and regulations was extremely desirable, and the participants recommended the establishment of a working party of experts to draft uniform traffic laws and regulations for the countries of the region. It was expected that this would be based largely on the following international documents:

(i) *Convention on road traffic*

United Nations Conference on Road and Motor Transport held at Geneva, Switzerland, from 23 August to 19 September 1949, *Final Act and Related Documents* (United Nations publication, Sales number: 1950.VIII.2)

(ii) *Licensing of motor vehicle drivers*

"Report submitted by the Committee of Experts on Licensing of Motor Vehicle Drivers to the sixth session of the Transport and Communications Commission" (E/CN.2/133—E/CN.2/Conf.2/3 and Add. 1 and Corr. 1 and 2).

"International road transport: Driver-licensing regulations and practices" (E/CN.2/96).

(iii) *Uniform system of road signs and signals*

"Final report submitted by the Group of Experts on Road Signs and Signals to the sixth session of the Transport and Communications Commission" (E/CN.2/119 — E/CN./2 Conf.1/12).

"Reports by members of the Group of Experts on Road Signs and Signals on field tests of selected road signs" (E/CN.2/Conf.1/6 and Add.1 and Add.1/Corr.1).

Economic and Social Council Official Records, nineteenth session, supplement No.4, Report of the *Transport and Communications Commission, seventh session* (7—15 February 1955), Part III, "Uniform system of road signs and signals".

Ibid., resumed nineteenth session, supplement No.1 A: Economic and Social Council Resolutions, resolution 567B(XIX) "Uniform System of Road Signs and Signals".

II. PREDICTION OF FUTURE INCREASES IN TRAFFIC AND VEHICLE REGISTRATION

A. Need for traffic studies

63. All agencies concerned with traffic must take into account probable traffic needs in the future. Forecasting should be based on accurate comprehensive data for various types of vehicle, including number, physical characteristics and extent of operation and use. Statistical information covering the following points is of prime interest to governments and private agencies:

(a) The number and types of vehicles, their maximum axle load, the fuel consumption and tonnage of road traffic, required as a basis for general economic and financial planning;

(b) Distribution of traffic on road network, needed to determine the nature of improvements and new construction and to assess their economic benefits;

(c) Traffic volume and fluctuation, needed by agencies in charge of traffic operation and enforcement.

64. The above information may be classified broadly as follows, according to the type and purpose of the data: general statistics; traffic counts and censuses; and origin and destination studies.

B. General statistics

65. General statistics, usually presented on a country-wide basis, give information on, for example, types of vehicle, number of vehicles in operation, fuel consumption and total milage travelled.

(1) Types of vehicle

66. Road traffic in the countries of the ECAFE region is heterogeneous. In most areas, vehicles cover a wide range in type and performance; they include motor vehicles, slow-moving animal-drawn vehicles, hand carts, bicycles and tricycles. As they mingle in the traffic stream, they interfere with one another, and the flow characteristic, that is, operating speed and traffic volume, are affected. This type of traffic flow has been designated "mixed traffic conditions".

67. In order to achieve comparability in the results of traffic surveys and to increase their effectiveness and utility, a uniform classification of vehicle types should be used in the ECAFE region for traffic studies and research, particularly for a traffic census. Vehicles may be classified as follows:

(a) Non-automotive vehicles: human propulsion (cycles of all types including rickshaws, cycle rickshaws and tricycles); animal-drawn (carts of all types);

(b) Motor cycles with or without side-cars (including bicycles with auxiliary engines and scooters); passengers cars; light trucks; heavy trucks; articulated vehicles (tractor and semi-trailer combinations); truck and trailer combinations; buses (all types and sizes); special vehicles (such as agricultural tractors, motor graders).

(2) Vehicle registration

68. The number of motor vehicles registered with motor vehicle agencies shows the trend and rate of motorization. In countries which have annual controls through re-registration or vehicle inspection procedures, this trend can be determined accurately and projected into the future.

69. Table 1 shows the number of automobile registrations in the countries of the region. The information is incomplete, however; action should be taken by ECAFE in co-operation with governments to make annual accurate and comparable figures available. The data should cover all other types of motor vehicles in operation, including motor-cycles, scooters and bicycles with auxiliary engines. Reliable estimates should be computed every year for vehicles which are not subject to registration.

(3) Fuel consumption statistics

70. Accurate figures showing the annual consumption of different vehicle fuels (petrol and diesel oil) are usually available from government statistics; they indicate the over-all magnitude of road traffic. Fuels consumed for other purposes, such as railways, agricultural tractors, ships and fixed power plants, should be deducted from these figures.

Table 1. Automobile Registrations in Asia and the Far East, 1955 [a]

(Thousands of vehicles)

Country	Passenger cars	Commercial vehicles	Total [b]
Burma	12.9	11.4	24.3
Cambodia	—	—	9.3
Ceylon	55.2	20.7	75.9
China (Taiwan)	4.8	7.1	11.9
Federation of Malaya and Singapore	99.0	32.3	131.3
Hong Kong	17.4	3.7	21.1
India	183.7	146.7	330.4
Indonesia	63.6	55.2	118.8
Japan	148.0	685.0	833.0
Korea, southern	2.4	7.0	9.4
Laos	0.23	0.42	0.65 [c]
Pakistan	33.4	18.2	51.6 [c]
Philippines	58.7	62.1	120.8
Thailand	19.1	23.0	42.1 [d]
Viet-Nam, southern	—	—	24.4
Total	—	—	1,804.9

Source: United Nations, *Statistical Yearbook, 1956* (except for Japan); figures represent data available at the end of the year.

[a] It is appreciated that a table of this kind would be more valuable if the number of vehicles could be compared with the population, the area of the country and the kilometres/miles of roads, but these figures were not readily available.

[b] Total (Asia and the Far East, excluding mainland China and the Union of Soviet Socialist Republics in Asia).

[c] 1954.

[d] 1953.

(4) Total travelled milage

71. Annual milage travelled, though based on fuel consumption, gives a more accurate index of annual traffic activity. It represents the total distance travelled annually by all motor vehicles in a country. The computation assumes an average annual milage travelled by each type of vehicle, based on results of sampling inquiries and checked against total fuel consumption. The total annual milage travelled is generally used as a traffic index to measure the rate of traffic accidents. The distance travelled by non-mechanically propelled vehicles, such as bicycles, tricycles and animal-drawn carts, should be estimated and added to the motor vehicle milage.

72. Figures on total milage travelled should indicate total distances travelled by different types of vehicles, thus making it possible to derive annual estimates of road freight and the number of passengers transported. A general study of average annual distances travelled by different categories of vehicles has not yet been undertaken in the ECAFE region, however. The Seminar was of the opinion that such a study should be initiated.

(5) Trend of traffic increase

73. Data such as those described may be used to predict the rate of traffic increase for both short-term and long-range forecasts. In general, trends in motor vehicle registration and utilization are related to an increase in either total national income or *per capita* income. However, trends in countries of the region are not yet sufficiently clear to warrant definite conclusions with regard to ultimate traffic volume and saturation levels. In fact, the countries of the region are in different stages of development and show varying tendencies. In the Philippines, for example, the use of public transit vehicles appears to be favoured; in Japan, which has a thriving new motor vehicle industry and three assembly plants for foreign cars, the number of private cars is steadily growing. In the central Asian parts of the Union of Soviet Socialist Republics, goods and passengers are transported by public vehicles, and privately-owned passenger cars play a negligible part in the country's economy.

C. Traffic counts and censuses

74. Traffic counts and censuses are useful in determining the volume, composition and fluctuations of traffic carried by different sections of the road network in a district or city, or in an entire country. In either case, traffic data should be collected according to a predetermined and well-planned scheme for scheduled counting. The two methods generally employed, usually in combinations, are manual counts and automatic traffic recorders.

(1) Manual counts

75. Manual counts are taken by field observers provided with appropriate forms. They are mainly used to obtain time data on the composition of the traffic flow at selected locations and for specific periods. In urban areas, they are also used to classify the pattern of traffic at intersections into through, right-turn and left-turn movements; the results are known as directional counts.

76. If traffic recorders are not available, a system of manual counts may be used for a periodic census of the rural traffic volume in a country. Such a census is taken at selected counting stations, where the number and type of vehicles and the direction of travel are recorded hourly during a certain number of days in the year. Fourteen days are recommended, and they should be distributed to eliminate weekly and seasonal variations. On counting station is necessary for each homogeneous section of road, that is, the section between two towns or two important intersections. The counts are generally taken for sixteen hours (6 a.m. to 10 p.m.) or for twenty-four hours for some important stations. A desirable uniform classification of vehicle types is presented earlier in this section of the report.

77. A general traffic census gives the annual average daily traffic (AADT) on the main sections of the road network for a specified year. It should be repeated periodically, about every four or five years.

78. A general traffic census of this type was conducted in 1955 for all European countries under the auspices of the Economic Commission for Europe (ECE). The same rules, and in particular the same census dates, were adopted in these countries in order to ensure comparable results. Although international road traffic is not so great in the ECAFE region as in Europe, the need for basic

comparable information on traffic volume makes it desirable that a co-ordinated traffic census should be organized under the auspices of ECAFE.

(2) Automatic recorders

79. Automatic recorders, either fixed or portable, are essential for traffic volume studies, since they show periodic fluctuations in the traffic flow. In the fixed recorder, the detector consists of photoelectric cells or rubber pads connected to an electric switch, and can in practice be installed only on major thoroughfares or main arteries in urban areas. In the latter case, a detector placed at a traffic-actuated signal system may be used as a fixed traffic recorder.

80. In the portable type, the detector is a rubber tube which is stretched across the roadway and connected with an air switch. The hourly volumes are printed automatically on a recording tape. Simpler models without recording tape are also available and show a cumulative total which may be noted at fixed times or days.

81. Manual counts giving classification by type of vehicle and corrections for axle counts are necessary to supplement figures shown by automatic recorders.

82. With the aid of recording equipment, rural traffic volume counts may be conducted economically on a comprehensive basis throughout the year. The road network is first classified into homogeneous sections on the basis of volume data already available, according to predominant travel purposes. Depending upon the density of population in the area and the degree of scattering of towns and villages, sections generally range from 5 to 30 kilometres, 20 kilometres being a recommended average. The sections are covered by counting stations which are divided into three types, according to the schedule of counts: permanent counting stations, control stations and coverage stations.

83. Permanent stations conduct counts throughout the year, while at control and coverage stations counts are repeated periodically according to appropriate schedules. Control stations should be selected to represent the traffic pattern of a group of coverage stations. The schedule of counts at control stations is either five days (including Saturday and Sunday), monthly for major control stations or two week-days six times during the year, in alternate months with other control stations.

84. Although the standards set forth for coverage stations by the United States Bureau of Public Roads recommend counts of 48 hours on week-days, to be taken once a year, it seems advisable, at least for the first three or four years, to have periodic counts conducted annually in ECAFE countries. A frequency of two or four counts a year, on week-days properly spaced, each of 24 hours or 48 hours ' duration, is recommended, since it would show the pattern of seasonal variation. Control stations may be selected on the basis of these counts.

85. As in the case of automatic recorders, manual classification counts indicating all categories of motor vehicles for periods of 8, 16 or 24 hours should be conducted periodically at permanent and control stations.

86. In urban areas, a similar system involving permanent control and coverage stations, supplemented by classification and directional counts, would help in constructing a traffic flow map of city streets. Equipment including 20 to 40 portable recorders is required in large cities (with a population of one million and over) for carrying out a volume survey.

87. Continuous counts taken at permanent stations are essential for accurate determination of the figure for hourly volume to be used for design purposes. The volume selected should eliminate hourly extremes which may be experienced only a few times during the year. If hourly counts on a highway are available for the period of a full year and are arranged in descending order of magnitude, the thirtieth highest hour is generally regarded as a reasonable volume which a highway under consideration should normally be expected to accommodate easily. This volume, selected as a reasonable basis for design or operation, may vary according to the functions of the road (main communication road, road largely for recreational purposes, farm-to-market road, suburban major artery); in the majority of cases, it falls between the twentieth and fiftieth highest hour by figures.

88. It is common practice in the United States and Europe, based on extensive experience, to use the thirtieth highest hour for rural roads; the corresponding volume is usually a stable percentage of average daily traffic: 15 to 16 per cent, or approximately one-sixth; and in all usual cases it does not fall outside the range of 12 to 18 per cent of the annual average and daily traffic (AADT).

D. Origin-destination studies

89. In highway planning and traffic operation, it is not enough to determine the actual volumes of traffic carried on existing roads. Detailed information is often required regarding individual trips; their total makes up the travel pattern pictured in a traffic flow map. The trips may be identified by their points of origin and destination. This is necessary in order to estimate the amount of traffic on a proposed facility or an improved transit itinerary. For example, when a bypass road is to be built around a town, an origin-destination survey would indicate how many drivers would be willing to use the bypass. The design or re-design of a complex intersection may be much lower in cost if it is based on a thorough analysis of traffic streams at intersections, made possible by a check of licence plates (see below).

90. Although a detailed study of procedures for origin-destination surveys is beyond the scope of this report, for each type of problem there is an appropriate method, based on interviewing or observing a representative sample of drivers. The methods most commonly used are as follows:

(i) Licence plate method. This is especially adapted to locations (such as busy or complex intersections) where traffic is too heavy to be stopped for interviews. The licence plate number, or a specified number of its digits is

recorded for each car passing through a control station, thus showing the station through which is passed. Certain stations are designated as points of origin or destination of trips for the purpose of the study.

(ii) Postcard method. A car is handed to the driver with a request that he answer certain questions and mail it back to the survey authority.

(iii) Roadside or home interview. Drivers, selected by random sampling, are interviewed either when stopped on the road or at home. This survey procedure has been widely used in Europe and the United States, but in the ECAFE region it has been used only in Japan, to study traffic problems in the Tokyo metropolitan area. Figure I. is a diagram of the origin and destination survey in Tokyo.

E. Forecast of future traffic needs

91. The survey methods described above are useful in determining future traffic needs for a specific traffic facility or route, or for a more extensive area, such as a large city and its suburbs. Such appraisal is warranted in the case of a general traffic increase in a country, or special factors and circumstances.

92. A general increase in motor traffic depends upon several factors, including changes in population, automobile output and sales and national income. A forecast generally takes the following trends into account: population, motor vehicle ownership, total milage travelled, national income, and land utilization and development.

93. Examples of these trend curves are shown in figures II III and IV which represent the growth in vehicle registration, road freight and number of passengers transported by road in Japan. Analysis of relevant trends gives the estimated number of vehicles in operation and the total milage in 1960 and 1965 (table 2).

94. It is estimated that in 1965 the total traffic volume in Japan will be 2.7 times that of 1955. In other countries of the ECAFE region, similar expansion may be expected to take place in a ten-year period.

Table 2. Japan: Actual and Projected Number of Vehicle Registrations, 1955, 1960 and 1965

(Thousands of units, unless otherwise indicated)

Item	Year [a] 1955	1960	1965
Trucks	651	1,063	1,731
Buses	34	51	71
Other passenger vehicles	148	254	455
Light motor vehicles	571	920	1,481
Total	1,404	2,288	3,738
Total vehicle-kilometres (millions)	21,700	36,870	59,520

Source: Government of Japan, *Engineering and Traffic Aspects of Highway Safety* (February 1957), p. 141.

[a] At end of September.

95. In addition to an over-all increase in traffic as estimated on the basis of the above-mentioned trends, other factors may influence the amount of traffic which will be carried by a new or improved traffic facility. Consideration should be given to traffic diverted by a new facility from existing roads or from other means of transportation, such as railway lines, to additional traffic attracted by new feeder roads, and to new traffic generated by land development projects, new industrial undertakings, housing programmes and similar developments. In many instances, such developments have been made possible by the construction of the new traffic facility, and the traffic may be regarded as having been generated by the facility.

96. The sum of diverted traffic and newly generated traffic is called "induced traffic". An interesting example of the application of these forecasting methods is in the Nagoya-Kobe expressway in Japan, which is to be opened to traffic in 1961. The diversion of traffic was classified as follows: truck from existing roads, rail freight traffic, bus traffic from existing roads, passenger traffic from railway, and passenger traffic from existing roads.

97. In the ECAFE area, most countries are in an early stage of traffic development, and a new road may well be the essential factor required for some new undertaking or the development of a new trade; in such cases future traffic should be appraised by an economic analysis, with due regard to the expected nature and volume of transported goods.

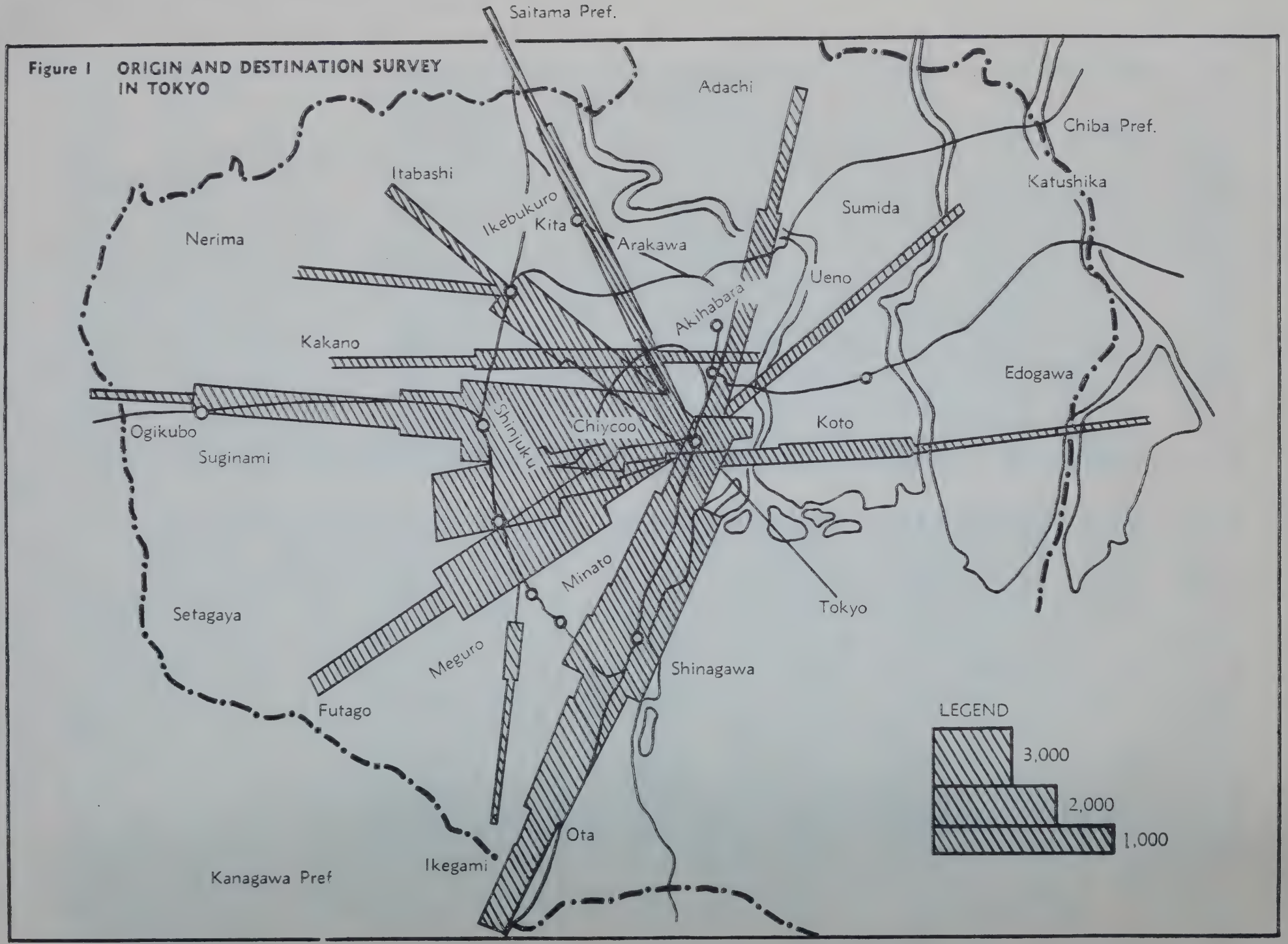


Figure 1 ORIGIN AND DESTINATION SURVEY IN TOKYO

Figure II NUMBER OF MOTOR VEHICLES (as of March 31)

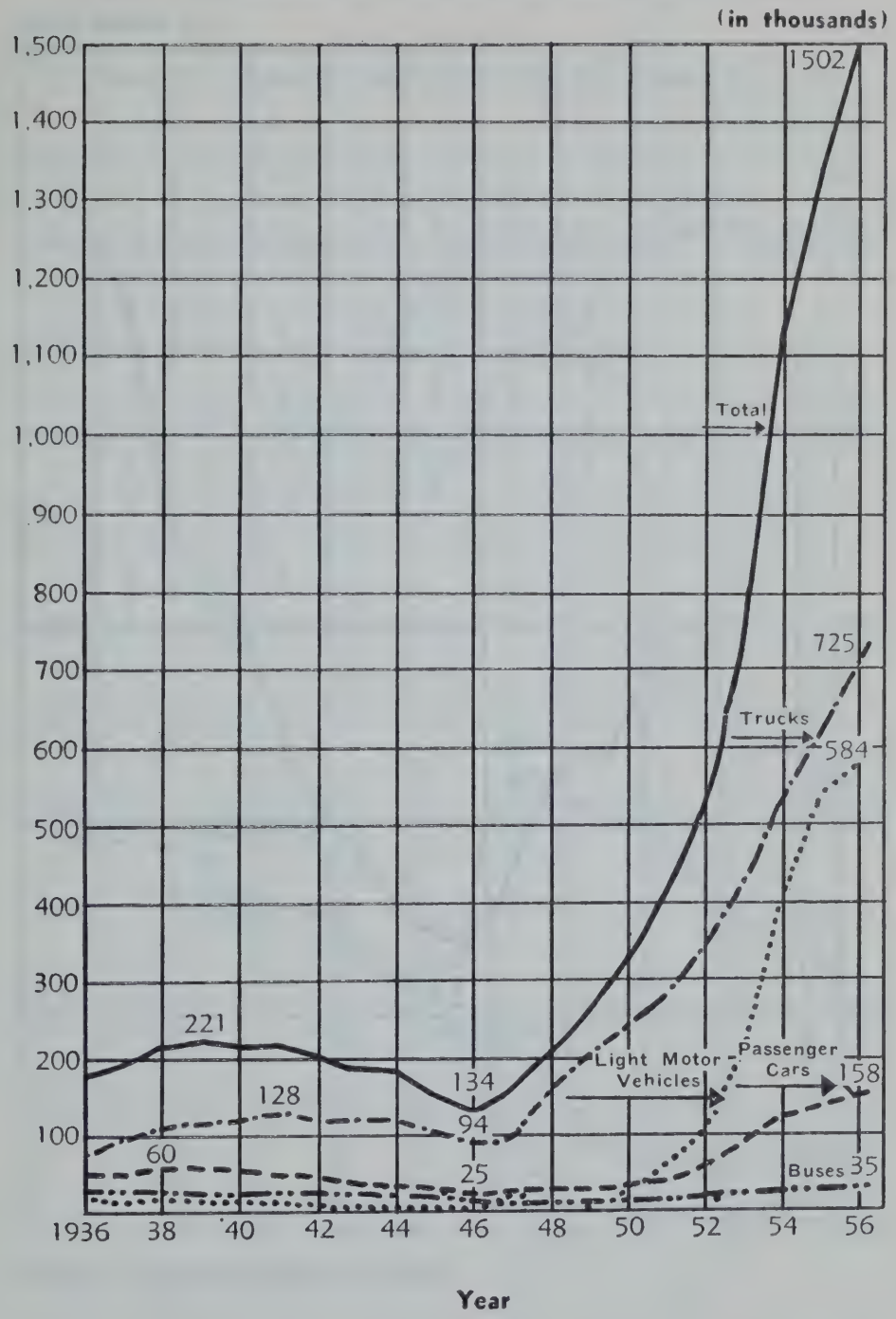


Figure III TONNAGE OF FREIGHT TRANSPORTED

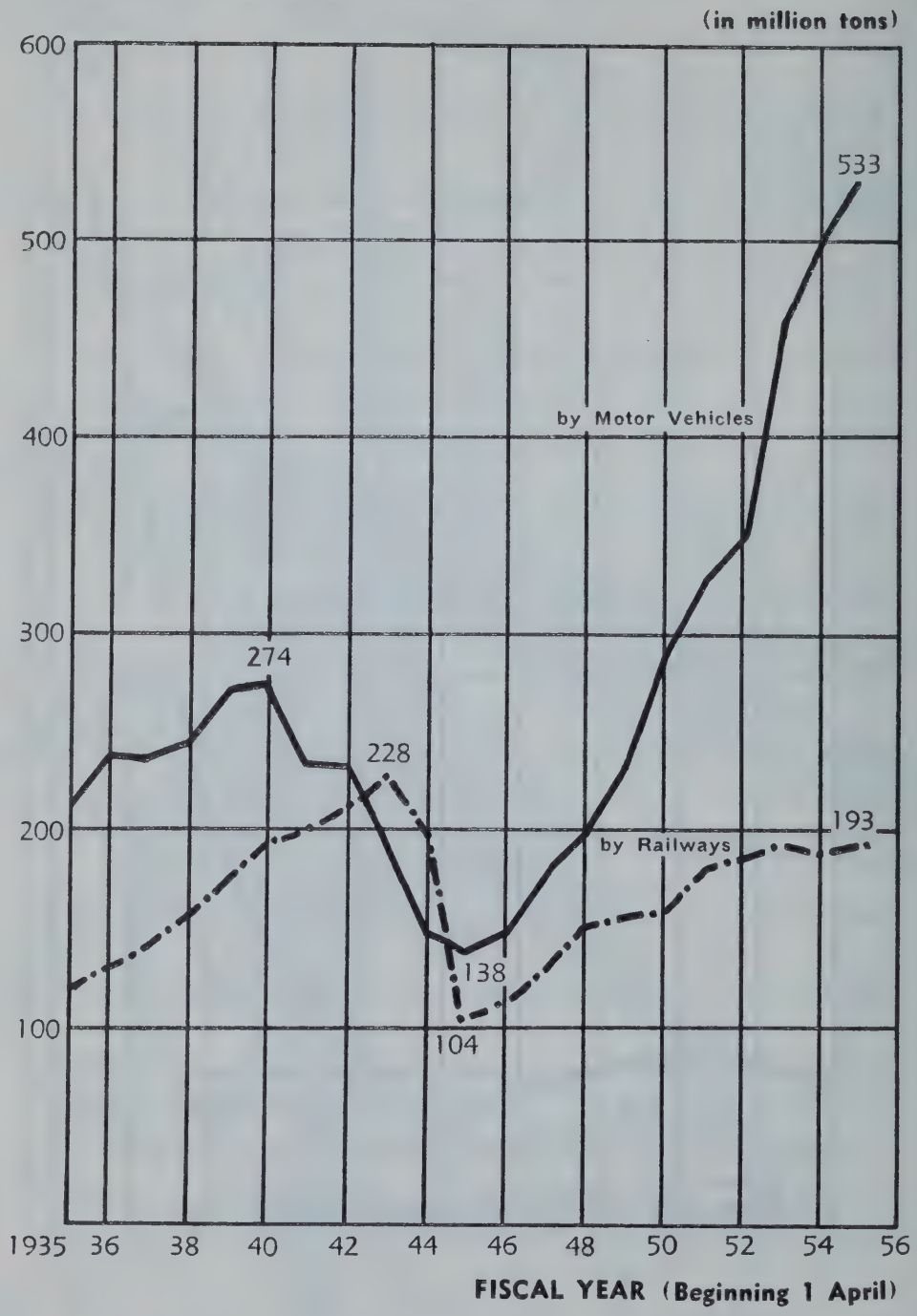
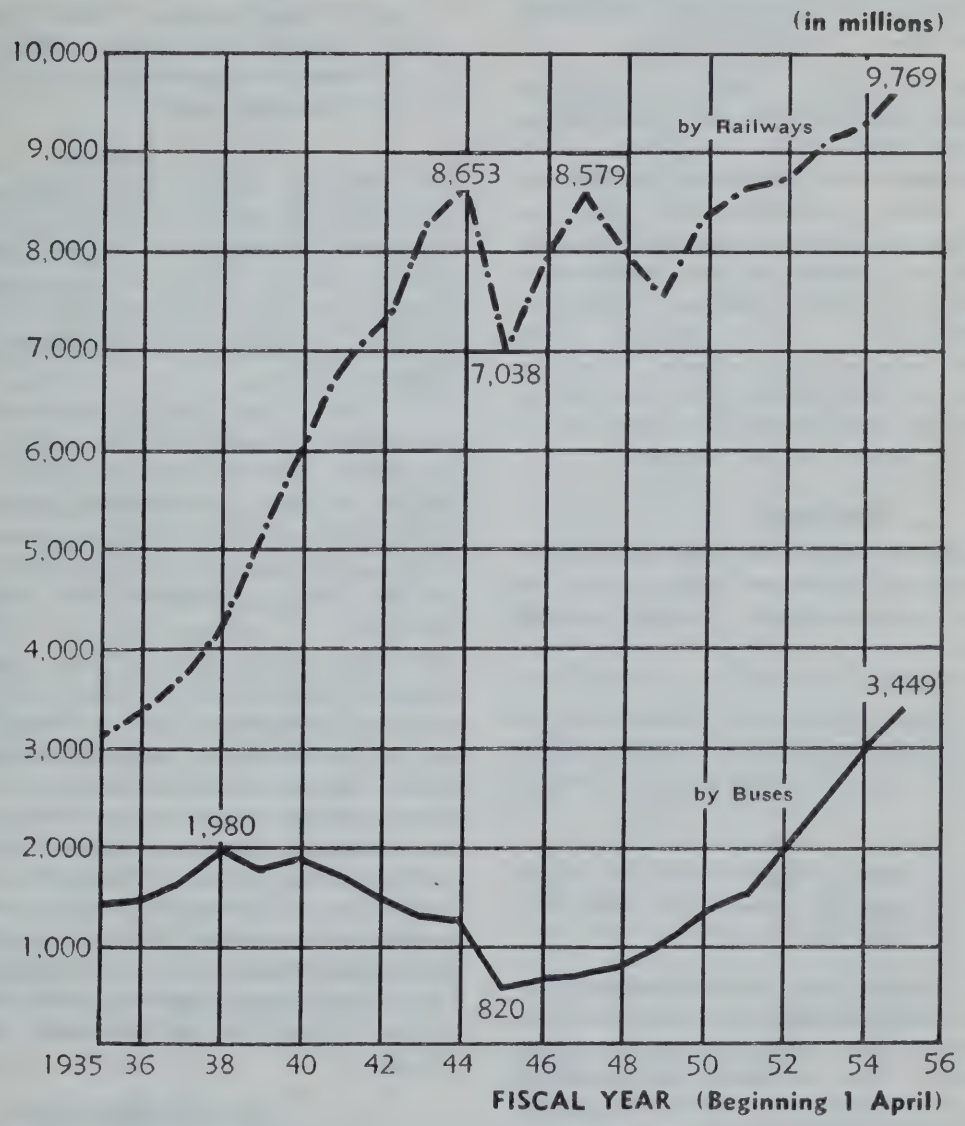


Figure IV NUMBER OF PASSENGER TRANSPORTED



III. ACCIDENT RECORDS AND THEIR USES

A. Need for accident records

98. Accident records are required to draw up measures to prevent accidents, to study accident causes and trends, and to evaluate the effects of preventive measures.

99. Maintenance of accident records on a sound and uniform basis enables highway authorities to assess accident causes to take remedial action. Such records are vital to the proper enforcement of regulations and to the most effective use of available police manpower. They are required as a basis for safety rules and regulations for drivers, pedestrians and vehicles, and as an indication of the need for additional statutory legislation. They may also serve a useful purpose in convincing authorities and the public of the need for specific improvements. The value of accident records, however, depends upon three factors: full reporting of traffic accidents, adequate maintenance of records, and analysis of the causes of accidents.

B. Definitions

100. A system for recording traffic accidents should be comprehensive; this can be achieved only if there are uniform rules for reporting accidents. As noted in section I, the basic traffic laws of a country should include legal requirements for reporting accidents.

101. Comparability of accident data in different countries of the region requires uniform definitions. The following are suggested for use in traffic accident records and studies for the region:

(a) Vehicle accident: Accident resulting in death, injury or property damage that involved a vehicle in motion on a road.

(b) Fatal accident: Vehicle accident resulting in the death of one or more persons. Since death may occur some time after an accident, it is necessary to obtain information on the physical condition of victims during a subsequent period. The Seminar considered that an appropriate period would be 30 days following the accident, as is the practice in the region of the Economic Commission for Europe (ECE).[3]

(c) Serious injury accident: Vehicle accident in which the injured person(s) sustained fracture, concussion, internal injuries, crushing, severe cuts, lacerations or severe general shock with detention in hospital for a period of at least 48 hours.[4]

(d) Slight injury accident: Vehicle accident resulting in an injury not classified as serious.

(e) Property accident: Vehicle accident which did not cause loss of human life or personal injury, but in which damage to property was the immediate result.

C. Reports

102. The law should contain mandatory provisions for reporting to the police all accidents involving death or injury and, if possible, all accidents causing damage to property. In the case of property damage, reporting of accidents involving minimum damage of US$25 is recommended as an alternative to the reporting of all property damage accidents.

103. Police officers who may have to investigate or report traffic accidents should be familiar with the details required for records; forms showing the details should be made available to them. As mentioned in section I, a special traffic branch should be established in every police force for the systematic uniform investigation and review of accident causes; if possible, this branch should be centralized.

104. Since traffic conditions vary widely in different countries of the region, it is not necessary for all to adopt the same accident report form. Uniformity is desirable only in the collection of necessary basic information and in the compilation and presentation of annual accident statistics for the area. Various forms in use in France, the Philippines and the United States (the state of Virginia) are contained in annex IV. They may serve as guides in improving the report forms used in some countries of the region. For countries without forms, the form used in Virginia may be recommended as a standard for reporting traffic accidents (for this purpose, the words "Motor Vehicle" in the title should be replaced by "Traffic").

D. Accident maps

105. Individual accident reports provide information for each accident, and accident maps indicate the location of accidents and their nature. The maps show the "black

[3] The period may be longer than 30 days if information can be obtained for beyond that limit. The difference between figures on the basis of 30 days and those for a longer period is negligible, however, but a greater proportion of deaths would not be recorded if a much shorter period—three to seven days, for example—were chosen.

[4] Experts from Japan considered that accidents should be in the "serious injury" category only when the full recovery of the injured person required more than 30 days.

spots" and offer a means of studying the effect of different densities and types of traffic, various road conditions, the effectiveness of road improvements and other road accident problems. Maps may be kept by the police and road authorities separately, but one complete set of up-to-date maps, properly maintained and displayed, is all that is required.

(1) Scale of maps

106. Since police districts in different parts of a country vary widely in density of population and the number and nature of road accidents, it is not possible to suggest a standard scale for maps. Survey maps with scales ranging from 1/100,000 to 1/1,000 are usually available. If local authorities have maps drawn in different scales, they may be used by the police as accident maps.

107. Maps should be large enough to show accidents for a period of at least three months at any given time. Large-scale maps, for example, 1/2,000 or even 1/1,000 (60 inches to the mile on British standard scales, approximately 25 inches to the mile for 1/2,500) are suitable for very congested areas. For rural areas, 1/10,000 (approximately 6 inches to the mile) maps should usually suffice, but, if accidents are numerous, separate larger scale maps should be used.

(2) Preparation of maps

108. Main roads should be coloured on the maps, traffic light installations should be indicated, and police controlled crossings should be noted. The map should be marked in squares of convenient size, each square being denoted by a letter and a number for reference purposes.

(3) Method of marking accidents

109. Since accidents are usually concentrated in urban areas, it is probably sufficient, in congested areas, to map only accidents which cause death or personal injury. Accidents resulting in damage to property may be omitted so that the maps can indicate more clearly the places where there is danger to life and limb. In rural districts, it may be desirable to record all accidents. The point where each accident occurred should be marked on the map with a coloured pin. The pin-heads should distinguish between fatal accidents, accidents causing serious personal injury, accidents causing slight personal injury, and accidents resulting in damage to property only.

E. Collision diagrams

110. Collision diagrams show graphically the nature of all accidents at a particular location. They are recommended for the ready condensed information they furnish. Individual accidents are indicated by arrows showing the direction of movement of each vehicle or pedestrian involved; the exact spot of the accident need not be indicated. The path of the vehicles may be represented by solid lines and that of pedestrians by dotted lines, and the date and hour of each accident should be indicated. Figure V suggests symbols which might be adopted uniformly in the ECAFE region. Unusual weather or other conditions affecting the road, driving or pedestrians should be indicated if they have a bearing on the accident. If visibility is an important factor, night accidents may be circled to distinguish them from day-time collisions.

111. Collision diagrams may reveal that most of the accidents fall into one or more of the following categories, and may thus furnish clues for preventive measures:

(a) Right-angle collisions between vehicles at intersections;

(b) Right-turn collisions involving vehicles approaching one another;

(c) Rear-end collisions;

(d) Collisions between pedestrians and vehicles;

(e) Collisions or side-swiping by vehicles travelling in the same direction or turning;

(f) Head-on collisions;

(g) Vehicles running off the road at a curve or a narrowing of the roadway;

(h) Collisions with fixed objects at the margin of the roadway;

(i) Collisions with parked vehicles.

F. Tabulation and analysis

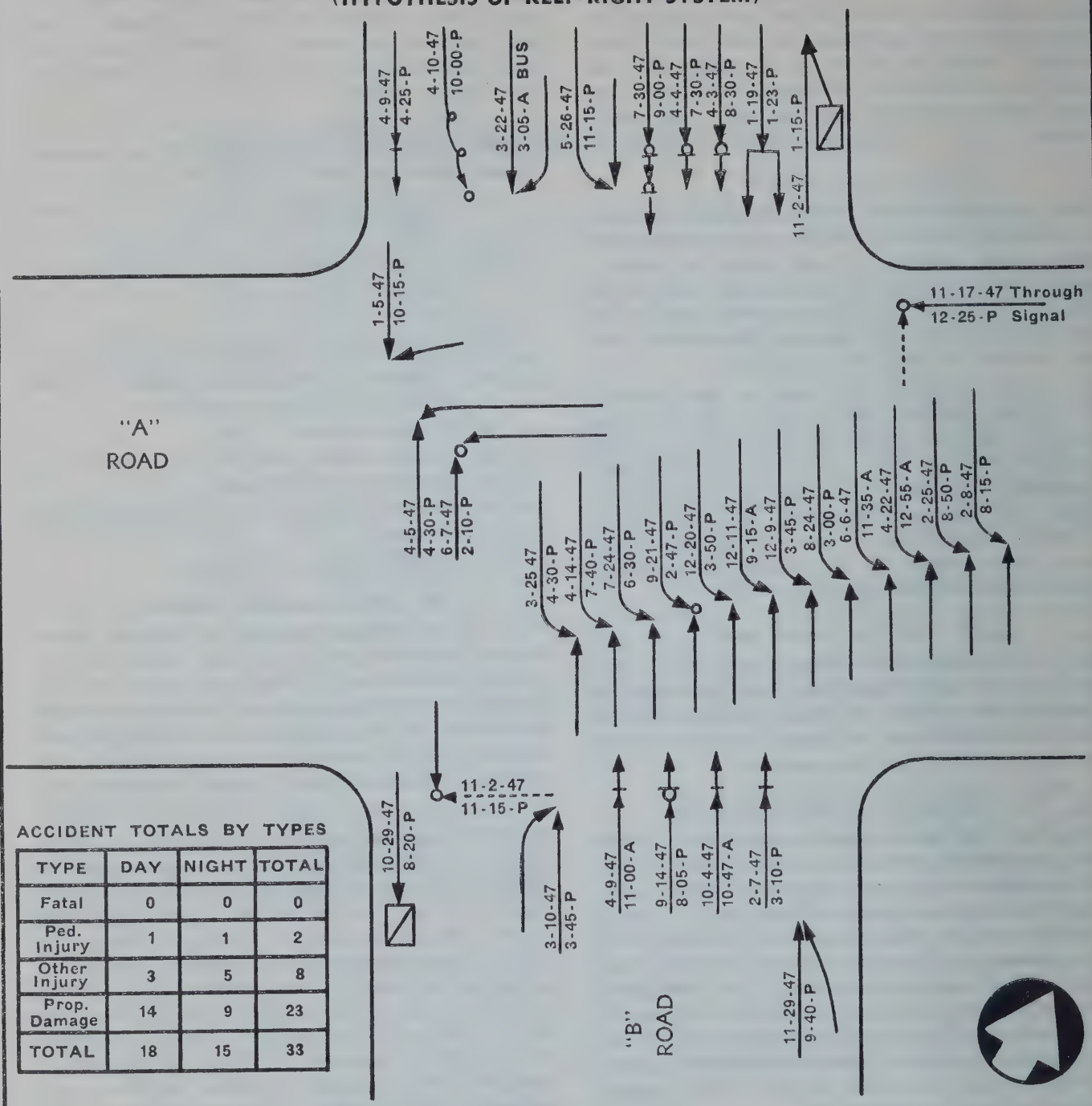
112. The information contained in accident reports provides government agencies with data which should be examined and analysed by trained and qualified persons. For maximum use of the information, mechanical tabulation and analysis are recommended to ensure that the usual periodical statistical statements can be prepared quickly, and that special analyses can be supplied without difficulty.

113. Significant data from the periodical statements should be singled out and published annually in order to enable responsible officials to compare trends in traffic accidents with those of other countries of the ECAFE region as a whole. Lack of such basic information accounts in part for the lack of method in reducing accidents. The kind of information particularly needed is indicated in tabular form in annex V. The forms are similar to those in use for several years in the ECE region. These tables may be used for a brief analysis of causes and circumstances of traffic accidents, which may be classified as driving violations, physical condition of driver and pedestrian, vehicle condition, road condition, and other circumstances.

G. Accident rates

114. Actual exposure to accidents is perhaps better expressed in terms of distance and volume of travel than of either population or vehicle registration. The milage death rate is defined as the number of deaths per 100 million vehicle-miles (or vehicle-kilometres) or as the number of accidents per million vehicle-miles (or vehicle-kilometres). Motor vehicle milages, as explained in section II, can be estimated either from traffic counts on roads at selected points or on the basis of petrol consumption figures.

Figure V COLLISION DIAGRAM FOR THE JUNCTION OF "A" ROAD AND "B" ROAD (HYPOTHESIS OF KEEP-RIGHT SYSTEM)



ACCIDENT TOTALS BY TYPES

TYPE	DAY	NIGHT	TOTAL
Fatal	0	0	0
Ped. Injury	1	1	2
Other Injury	3	5	8
Prop. Damage	14	9	23
TOTAL	18	15	33

LEGEND

- MOVING VEHICLE
- PEDESTRIAN
- PARKING VEHICLE
- PARKING OR UNPARKING VEHICLE
- FIXED OBJECT
- REAR END COLLISION
- HEAD ON COLLISION
- RIGHT ANGLE COLLISION
- LEFT TURN COLLISION
- SIDE SWIPE
- OUT OF CONTROL
- REAR END COLLISION WITH BACKING VEHICLE
- FATAL ACCIDENT
- PERSONAL INJURY
- PROPERTY DAMAGE ONLY

When traffic volume figures are used, if "D" represents the number of deaths that occur in one year on a section of highway, "S" the length, carrying a daily average of "Y" vehicles, the milage death rate "R" is:

$$R = \frac{D \times 100 \times 10^6}{S \times Y \times 365}$$

H. Research in road safety

115. Comprehensive reporting of traffic accidents and proper maintenance of records are only first steps towards more detailed investigation and research with respect to traffic safety. Highway and automobile engineers, lighting specialists, police, physiologists, psychologists and many others all have a part to play in the study of various relevant factors, and their co-operation is required.

116. The contribution of the highway engineer is of great importance because of his responsibility for the design, construction and maintenance of highways. His responsibilities, in co-operation with others, include the road, the vehicle, road users and road traffic. All these factors should be studied not only separately, but in relation to one another. For example, problems arising from the movement of a large number of vehicles call for consideration of the distribution of vehicles in space and time, and of the reactions of the road user to the vehicle and the road; these considerations involve more than the characteristics of the individual units. Accident statistics play a vital part in establishing the causes of road accidents and are essential to road engineers and research workers.

117. The principal subjects of investigation having a direct bearing on road safety are listed below:

(a) Production of a road surface which is smooth, non-skid, light in colour and has minimum change in properties when wet;

(b) Texture and colour of road surfaces in relation to street lighting;

(c) The effect of cambers and curves;

(d) Determination of the most suitable forms of road markings with respect to visibility by day and night, and minimum obstruction to traffic;

(e) Methods of illumination and levels of warning signals and other traffic signs;

(f) Design, material, size, colour and type of signs, in relation to their visibility by day and night;

(g) Lighting of shelters, obstructions, and so on;

(h) Street lighting and its effect on road safety on various types of road;

(i) Relation between accidents of different types on dual carriageway roads, compared with those on single carriageway roads carrying a similar volume of traffic;

(j) The effect of junction design on road safety;

(k) The effect on road safety of palliative remedial measures if drastic reforms are not practicable.

1. Principal recommendations

118. The following recommendations were made by the Seminar:

(a) The basic items of accident reporting should be standardized as far as possible in countries of the ECAFE region.

(b) Definitions of fatal, serious injury and slight injury accidents should be clearly stated and standardized.

(c) The system of preparing accident reports and maintaining statistics should be flexible and uniform throughout the region.

(d) Accident maps should be kept, and the method of maintenance should be uniform within the particular country.

(e) Tabulation and analysis of accidents should be centralized and mechanized. Basic statistical information on accidents causing death or injury only should be made available annually to the countries of the region; presentation of the data should be uniform and may follow the sample forms given in annex V.

(f) Accident data should be made available to highway engineers, administrators of enforcement agencies, administrators responsible for improving motor vehicle driving and discipline (and used as an aid in drafting registration requirements) and officials responsible for public safety and information programmes.

IV. CAPACITY OF ROADS AND INTERSECTIONS

A. Definitions

119. The capacity of a road or intersection is its ability to carry a traffic flow. The statement of capacity is very complex, owing to the number of interrelated factors that have a bearing on the use of a section of road or an intersection by a great number of vehicles. The use of a road is influenced by the composition of the traffic flow, dimensions and performance of different vehicles, the width and layout of the road, and numerous conditions that pertain to human reaction and judgement. Classification of these factors and investigation of their influence on traffic operation help to indicate design standards for roads.

120. Capacity is defined as the maximum number of vehicles which can pass through a section of road or an intersection during a certain unit of time under specified conditions. As in the case of traffic intensity, it is commonly expressed in terms of vehicles per hour.

121. Since capacity and related factors have been studied for more than twenty years in Europe and America, the present section presents a brief summary of the principal findings in those continents, with special reference to the problems of the ECAFE region. A comparison of design standards in use in rural and urban areas in the region is included. Characteristics of capacity may be divided into two distinct categories: (i) Those pertaining to the physical features and arrangement of the road, or roadway conditions; and (ii) those relating to the characteristics of traffic using the road, or traffic conditions. The level of capacity varies with both roadway and traffic conditions.

122. According to the widely adopted definitions given in the *Highway Capacity Manual* issued by the United States Bureau of Public Roads (Washington, D.C.), levels of capacity are referred to as basic, possible and practical, each with standard specified conditions:

Basic capacity (theoretical or ideal capacity). Maximum number of passenger cars that can pass a given point on a lane or roadway during one hour under the most nearly ideal roadway and traffic conditions which can possibly be attained.

Possible capacity. Maximum number of vehicles that can pass a given point on a lane or roadway during one hour, under prevailing roadway and traffic conditions. This volume cannot be exceeded without changing one or more of the conditions that prevail.

Practical capacity. Maximum number of vehicles that can pass a given point on a roadway or in a designated lane during one hour without a traffic density so great as to cause unreasonable delay, hazard or restriction to the driver's freedom to manoeuvre under prevailing roadway and traffic conditions.

123. As indicated above, the assessment of practical capacity depends upon the driver's judgement of operating conditions and is thus subject to variation. Consequently, practical capacity—the most significant level from the engineering viewpoint—is expressed as a range of hourly volumes.

124. As previously mentioned, prevailing traffic conditions in most countries of the ECAFE region, are of a mixed character. In rural as well as in urban areas, different types of vehicles are seldom separated; conflict and interference arise between motor vehicles and other types, owing to wide differences in speed and performance. This naturally affects road and intersection capacity considerably.

125. Such conditions are not characteristic of the United States, where traffic is more homogeneous as to type and performance of vehicles; capacity figures given in the *Highway Capacity Manual* are therefore not representative of conditions prevailing in the ECAFE region.[5] This points to the urgency of the need for special co-ordinated investigation by all countries of the region to ascertain the capacity values, characteristic of mixed traffic. In the meantime, however, certain estimates obtained in the United States and Europe may be tentatively applied or adapted to most countries of the region.

B. Capacity of roads in rural areas

126. The factors affecting capacity of roads in rural areas may be classified as follows: (a) type and size of vehicles forming the traffic flow; (b) speed and spacing of vehicles; (c) size and structural features of roads, including the width of lanes and shoulders, lateral and vertical clearances, alignment, grades, sight distances[6] and condition of the road surface.

127. Study of the relationship between speed and spacing is of fundamental importance in determining capacity; the spacing of vehicles in the traffic stream depends upon their operating speed. Although little research has been done on this subject in countries in the ECAFE region, it may be noted that Poisson's law of frequency distribution has been confirmed by Japanese field investigations of the spacing between successive vehicles in conditions of light volume and homogeneous traffic.

[5] The *Highway Capacity Manual* usually allows 10 per cent as the proportion of commercial vehicles.

[6] A proposed definition of sight distance is contained in the draft agreement and specifications for uniform road marking (see annex VI).

128. For roads having sufficient width of lane, 3.50 metres to 3.60 metres (12 feet), and carrying a relatively homogeneous traffic with a negligible number of cycles and motor cycles, the figures given in the *Highway Capacity Manual* and reproduced in table 3 may be applied.

Table 3. Highway Capacity for Uninterrupted Flow under Ideal Traffic and Highway Conditions

(Passenger cars per hour)

Item	*Two-lane, two-way highway: total for both lanes* a	*Three-lane, two-way highway: total for all lanes* a	*Multiple-lane highway: average per lane* b
Basic capacity c	2,000	4,000	2,000
Practical capacity for urban conditions d ..	1,500	2,000	1,500
Practical capacity for rural conditions e ..	900	1,500	1,000

Source: United States Bureau of Public Roads, *Highway Capacity Manual*, p. 52.

a Distribution by direction is not a factor.

b For direction of heavier flow; during periods of peak flow, traffic may be much heavier in one direction than in another.

c Same as possible capacity for ideal conditions.

d Providing operating speed of 35 to 40 miles per hour (60 kilometres per hour).

e Providing operating speed of 45 to 50 miles per hour (75 kilometres per hour).

129. Some observations have recently been made in Japan with respect to the influence of lateral obstructions on road capacity. With two objects, 150 centimetres and 20 centimetres in height above the ground, the width of shoulder should be at least 1.10 metres if the height of the object on the shoulder is more than 25 centimetres; and 0.60 metre if the height of the object on the shoulder is under 25 centimetres, in order to avoid any effect on the vehicle path.

130. Further investigation is needed; until final results are obtained, the percentages of reduction in capacity as given in the *Highway Capacity Manual* for narrow lanes or insufficient lateral clearances may be applied. Detailed figures are given in tables 4 and 5; the effect of lateral clearance is shown as a reduction in the width of the lane.

Table 4. Effect of Lane Width on Capacity

Width of lane		*Reduction of capacity (in percentage)*	
Metres	*Feet*	*Practical capacity*	*Possible capacity*
3.60	12	—	—
3.30	11	14	12
3.00	10	23	19
2.70	9	30	24

Source: United States Bureau of Public Roads, *Highway Capacity Manual.*

Table 5. Effect of Restricted Lateral Clearance on Practical Capacity

Clearance from pavement edge		*Effective width of a two-lane rural road 7.20 metres (24 feet) wide*	
Metres	*Feet*	*Metres*	*Feet*
1.80	6	7.20	24
1.20	4	6.90	23
0.60	2	6.30	21
—	—	5.40	18

Source: United States Bureau of Public Roads, *Highway Capacity Manual.*

131. Sufficiently wide shoulders are necessary to keep parked or disabled vehicles off the highway. Tables 4 and 5 show the marked reduction in capacity that may result from stationary vehicles parked or encroaching on the highway.

132. As is evident from the study of vehicle spacing, capacity is greatly reduced on two-lane and three-lane roads where the sight distance is below that required for safe passing. With a relatively homogeneous flow (10 per cent trucks and slow-moving vehicles), passing sight distances are approximately between 450 metres to 600 metres (1,500 to 2,000 feet). If the sight distance falls under 450 metres on some sections of the road, its practical capacity is greatly reduced, as shown in the table 6.

Table 6. Effect of Sight Distance Restriction on Practical Capacity of Two-Lane Road with adequate Stopping Sight Distance

Percentage of total highway length a	*Practical capacity (passenger cars per hour)*	
	Operating speed 75 kilometres per hour b	*Operating speed 90 kilometres per hour* c
—	900	600
20	860	560
40	800	500
60	720	420
80	620	300
100	500	160

Source: United States Bureau of Public Roads, *Highway Capacity Manual.*

a Sight distance restricted to under 458 metres (1,500 feet).

b 45 to 50 miles per hour.

c 50 to 60 miles per hour.

133. Capacity is reduced as the proportion of commercial vehicles increases, since they are slower and more cumbersome than passenger cars, especially on grades. The influence of commercial vehicles and grades on capacity is analysed in detail in the *Highway Capacity Manual.* With respect to capacity, each commercial vehicle may be regarded as equivalent to (n) passenger cars, the coefficient (n) varying with slope and length of grade and also with passing sight distance restriction. In the United States, the values of (n) extend from 2 in level terrain to 4 in rolling terrain and 8 and even more in mountainous areas.

134. These figures indicate how capacity may be affected by conditions of mixed traffic such as exist in most countries of the region. Even where animal-drawn carts are not predominant, passenger cars are seldom in the majority. In Japan, for instance, the composition of the traffic flow with regard to motor vehicles only shows that the majority of motor vehicles on the road are commercial vehicles, as indicated in the following figures showing the average compositions of the traffic flow in Japan:

	Percentage
Trucks (medium-sized and large-sized)	20
Trucks (light)	35
Buses	5
Passenger cars	25
Motor cycles and motor scooters	15

135. Capacity is also reduced by cycle traffic which is increasing rapidly in all countries of the region; it includes bicycles and a large number of tricycles, called cycle rickshaws, which are used particularly in urban areas as, for instance, in Bangkok. In Japan, surveys indicated an increase in cycle traffic of 50 per cent between 1948 and 1953, and the same trend appears to have continued since then. In India, the use of bicycles is favoured in cities as a means of easing parking problems.

136. In the ECAFE region, the large number of motor cycles and bicycles (often designated as two-wheel vehicles) in road traffic makes conditions somewhat similar to those in certain countries of Europe. Studies are being made of the subject, but no final conclusions regarding rural areas have been reached.

137. There is an evident difference in character and performance between motor cycles (or scooters) and bicycles. While the speed of the former is comparable with that of a motor-car and has no greater effect on capacity than a small passenger car, bicycles, with or without auxiliary engines, are capable of only low speeds (10 to 40 kilometres per hour). They are cumbersome, and may greatly reduce road capacity if large numbers are on the road. In that event bicycles may be segregated from motor traffic by means of separate parallel cycle tracks. In other cases, the construction of a cycle track may not be justified; however, two cyclists riding abreast or walking up-grade may block the full width of a traffic lane, thus impeding the flow of faster cars.

138. The effect of two-wheel vehicles in reducing road capacity is of course greater if traffic lanes are narrow. On a two-lane road seven metres wide, two cars and a motor cycle or bicycle may normally be accommodated in the same cross section. On a road six metres wide, however, a car overtaking a motor cycle or bicycle necessarily encroaches on the other lane and cannot pass if a vehicle approaches from the opposite direction.

139. In evaluating the influence of cycles on road capacity, the method indicated for trucks may be used, that is, determination of coefficients of equivalence, using the passenger car as the unit of measurement. The following values, which, though not confirmed by comprehensive studies, have proved useful in Europe, may be adopted: bicycle or motor bicycle, one-fifth of a passenger car; motor cycle or scooter, one-half of a passenger car. These values are applicable to normal lanes (width of 3.50—3.60 metres) and roads at level grade; values 50 to 100 per cent higher should be used for narrow lanes and rolling terrain.

140. These coefficients are applicable, however, only when the number of two-wheel vehicles represents but a small part of the traffic volume. In general, when traffic on a rural road includes a high proportion of cumbersome or slow vehicles, there is a considerable reduction in traffic capacity; the solution may be found only in the segregation of traffic.

C. Capacity of roads and intersections in urban areas

141. In urban areas the capacity of streets is controlled by that of the intersections and is defined in terms of the capacity of approaches; it varies in almost direct ratio with the width of the approach, measured from the kerb line.

142. Urban intersections are generally at level grade, and the majority are not controlled by signals. Signals are necessary to give the right of way alternately to each intersecting street only if the usual priority rules do not permit traffic to clear without unreasonable delay because of the intersection layout (poor visibility, for instance) or high traffic volume.

143. In an evaluation of the capacity of approaches of intersections with signals, the travel pattern of vehicles passing through the intersection (except when weaving movements take place) may be assumed to be the same as though signals were installed, because each stream is stopped by crossing vehicles that are travelling on the transverse street. It is therefore essental to compute the capacity of an intersection with signals.

144. As defined in the *Highway Capacity Manual*, "the practical capacity of an intersection approach is the maximum volume that can enter the intersection from that approach during one hour with most of the drivers being able to clear the intersection without waiting more than one complete signal cycle." Since cycle phases vary with the location, capacity is generally expressed as the number of passenger cars or vehicles per hour of time on a green or "go" signal.

145. Owing to the complexity of urban traffic conditions in which the movement of vehicles is often impeded by pedestrians, cyclists, buses, parked vehicles, weather and other factors, the capacity of intersections depends upon the following:

(i) Width of approach at intersections;

(ii) Type of installation and timing of traffic signals;

(iii) Composition of traffic, particularly the number of commercial and slow-moving vehicles:

(iv) Number of turning movements, particularly right turns in a left-hand system (and conversely);

(v) Traffic control measures, such as one-way operation, parking prohibitions;

(vi) Location and arrangement of bus stops;

(vii) Pedestrian traffic;

(viii) Weather conditions.

146. All the above factors should be taken into account for each location in a detailed evaluation of practical capacity. It is therefore difficult to issue uniform standards. However, the following approximate figures are useful as a guide in road design and layout:

Highest capacity in ideal conditions.[7] Approximately 1,200 vehicles per hour on a green signal and per 3 metres of approach width; in ideal conditions, traffic at intersections consists mainly of passenger cars, with a low proportion of turning movements and no pedestrians.

Practical capacity in average prevailing conditions. The figure is 40 per cent lower, that is, 720 vehicles per hour on a green signal, 3 metres of approach width. In average prevailing conditions, 1,000 to 2,000 pedestrians cross per hour, 10 per cent of vehicles turn right and 10 per cent turn left. The proportion of commercial vehicles is 10 per cent.

147. According to the standards given in the *Highway Capacity Manual*, one commercial vehicle is equivalent to two passenger cars; one right-turning vehicle in a left-hand system equals 1.5 vehicles going straight through; and one left-turning vehicle in a right-hand system equals 2 vehicles going straight through. These standards are applicable when the proportion of turns does not exceed 30 per cent of all movements.

148. Appropriate equivalent values should be used for cycles and cycle traffic. The following equivalent values in terms of passenger cars are used in Europe and may be applied until the results of further research are available: bicycles—0.5, tricycles and cycle rickshaws—0.6 to 0.8, motor cycles—0.7 to 1.0.

149. If parking is permitted in the vicinity of an intersection, the capacity is lower because parked vehicles reduce the effective width of the road, and parking and unparking manoeuvres hinder traffic. Heavy left-turn movement is another cause of reduction in capacity, since it cuts across the oncoming stream and interferes with through traffic.[8] Low-speed turning movements also reduce the effective length of time on a green signal.

150. Since capacity can be increased only by eliminating the causes of reduction, the following measures are among those recommended:

(a) Widen roads for a distance of 20 metres (preferably 30 metres at approaches to intersections);

(b) Provide special lanes or channels by means of dividing islands, or lane markings designed for slow-moving turning vehicles, when in great number;

(c) Provide a specialized signal phase in the case of a very heavy turning movement;

(d) Control parking and provide parking lanes.

151. Certain traffic control measures, such as one-way operation, may also help to increase capacity by eliminating the opposing traffic flow and reducing confusion at intersections.

152. The need for traffic signals has been studied in Japan, with emphasis on cases where the volume of pedestrian traffic is large, but investigation of motor traffic has not been conducted there so far. As a rule, signals are not warranted at intersections where a street carries fewer than 400 vehicles per hour. This estimate is confirmed by the findings of American Association of State Highway Officials (AASHO), which indicate that signals were not warranted when the volume is less than that shown below (in vehicles per hour):

	Volume on major road	*Volume on minor road*
If the major road is a two-lane highway:	400	250
	500	200
	650	100
If the major road is a four-lane highway:	1,000	100
	1,500	50
	2,000	25

D. Design characteristics of various types of road

153. Study of road capacity and the factors influencing it is of fundamental importance in selecting design characteristics for road construction or improvement projects to satisfy present and future traffic needs. Since traffic, topography and economic conditions differ in countries of the ECAFE region, standards to be adopted should vary accordingly. Detailed discussion of such standards is, however, beyond the scope of the present report; further studies are needed before standards are adopted. The following remarks merely call attention to certain important points of roadway design for rural and urban areas.

154. A maximum design speed of either 80 or 100 kilometres per hour has been adopted in most countries of the region including China (Taiwan), India, Indonesia and Japan. The design speed varies with the class of road and the type of terrain, and geometric characteristics relating to the arrangement and profile of the road, such as horizontal and vertical curves and superelevation, are fixed according to the design speed.

155. The width of the pavement and the number and width of traffic lanes required depend mainly upon traffic volume and composition. Other factors to be taken into account include (a) maximum over-all width of vehicles using the road; (b) transverse placement of vehicles while travelling singly or passing or meeting other vehicles; (c) speeds of different types of traffic; (d) minimum width for safe driving; (e) effect of pavement width on accidents; (f) economies in increasing pavement widths by constructing shoulders of a less costly type.

[7] Also called basic capacity in the *Highway Capacity Manual.*

[8] In a right-hand system; right turns in a left-hand system.

156. On two-lane roads with high design speed or carrying a large proportion of commercial vehicles, a pavement width of 7.0 metres to 7.50 metres is desirable. Under mixed traffic conditions, the pavement width is not determined merely by the width of the lanes. In order to prevent slow-moving vehicles from seriously impeding the movement of motor-cars, a pavement width of nine metres is recommended. Depending upon the number of slow vehicles, lanes may be indicated by pavement colour and material, as in India.

157. The width and condition of shoulders have a substantial influence on the capacity of a road. In mixed traffic, the faster vehicles can be segregated by accommodating some slow-moving vehicles on the shoulders, if their surface is in good condition. If the total traffic volume is small, a pavement width of three to four metres with adequate shoulders may be acceptable.

158. Wherever practicable, measures should be taken to separate pedestrians, animal-drawn carts, pedal-cycles and other types of vehicle from fast traffic in order to increase the capacity of the road. Such segregation is particularly useful on main arteries in urban areas where the highest volume of traffic is usually concentrated.

159. In cities, raised sidewalks for pedestrians, limited by kerbs, ten to fifteen centimetres high are desirable. The width of the sidewalk usually ranges from two to five metres, depending on the importance of the street and available space.

160. In most countries of the region, however, the sidewalks are often occupied by street vendors, forcing pedestrians to walk on the roadway. Efforts should be made to clear the sidewalks of such obstructions.

(1) Provisions for cycle traffic

161. In all countries of the region, cycle traffic is developing rapidly and should be separated from faster traffic, especially in urban areas. As experience in Delhi and New Delhi indicates, cycle tracks have considerably reduced the number of accidents involving cyclists. It is difficult and not always practicable to provide all streets with cycle tracks, but separate cycle tracks are recommended along major thoroughfares and transit routes in cities and their suburban areas.

162. Studies in India of the need for cycle tracks indicate that separate cycle tracks appear justified when the peak-hour cycle traffic is 400 vehicles or more and the motor vehicle traffic is 100 vehicles per hour. When the motor vehicle traffic is 200 or more vehicles per hour, a cycle track is justified when the cycle volume is 200 per hour. In rural areas, however, such standards have not yet been established for cycle tracks. It is suggested that the rule adopted in France, that a separate cycle track is justified on roads carrying 500 or more pedal-cycles daily, may be used tentatively.

163. The following specifications for cycle tracks are used in India, and may be recommended as a guide for design:

Minimum width	2.10 metres (2.50 metres at underpasses)
Normal width	2.70 metres, (if overtaking is permitted)
Maximum gradient	1/50
Minimum curve radius	15 metres
Minimum sight distance	18-20 metres
Minimum width of separating verge or berm	1 metre

164. The above standards are meant for one-way cycle tracks. Larger dimensions may be advisable for a very heavy cycle volume. In France, a track three metres wide is recommended if the peak cycle volume is 1,000 or more for half an hour, this period corresponds to the usual duration of the peak cycle load on streets.

165. Two-wheel motor vehicles, such as cycles with auxiliary engines, motor cycles and scooters, appear likely to become more and more popular in countries of the region, and road design will pose difficult problems. While motor cycles and scooters having speeds comparable to those of motor-cars may remain on main roadways, the solution is not so clear in the case of cycles equipped with auxiliary engines capable of maximum speeds of 30 to 40 kilometres an hour. Road design for slow-moving vehicles depends on the number of such vehicles on the road, the proportion of pedal-cycles and motor vehicles, whether the area is urban or rural and similar considerations.

(2) Design of intersections

166. It is recognized that the design of highway intersections has a material influence on the frequency and seriousness of accidents. This is particularly true in the ECAFE region, where most of the traffic is concentrated in built-up areas. The elements of design of intersections at grade level are discussed in a document prepared by the ECAFE secretariat,[9] which contains information on types of at-grade intersections, recommended conditions, safe-turning radii, sight distances, visibility triangles and channels, with examples from the countries of the region, and covers the subjects of rotary and non-signalized intersections, and therefore this report (section I) merely includes some comments on intersections with signal controls. In Japan, there is a tendency to substitute intersections controlled by signals for rotary systems since rotaries are likely to cause obstruction when traffic reaches a high volume.

(3) Provisions for parking and bus stops

167. In urban areas where intensive parking is expected, the road width should provide sufficient parking space so that parked cars will not reduce the space needed for the movement of vehicles. The minimum width of a parking lane is two metres.

168. A bus which stops to load or unload passengers reduces the useful width of the road and interferes with the flow of traffic on entering or leaving the bus stop bay. The bus stop should therefore be located at a distance

[9] "Engineering Aspects of Highway Safety" (E/CN.11/TRANS/Sub.2/26, 28 May 1954).

from the nearest intersection, a minimum of 60 metres (200 feet) being usually recommended. A bay three metres deep should be provided outside the normal limits of the road, its length depending on the number of buses expected to stop at one time. The kerb line on either side of a bus stop should be designed to facilitate the movement of buses away from and into the traffic flow.

(4) Petrol filling stations

169. Vehicles entering or leaving petrol filling stations on roads with heavy traffic are likely to cause accidents if the stations are not properly designed. Certain minimum requirements should be imposed concerning the design of access roadways and the location of installations. The following specifications have been adopted in India on the recommendation of the Indian Roads Congress:

Minimum distance from an intersection	45 to 60 metres (150 to 200 feet)
Minimum frontage width	30 metres
Minimum width of driveways for entry and exit	9 metres
Minimum radius of kerb line	12 metres
Minimum set-back of pump from pavement edge	15 metres
Minimum set-back of service station from pavement edge	30 metres

(5) Right of way requirements

170. In most cities of the ECAFE region, the marked increase in traffic expected in the future requires that sufficient right of way should be provided for major arteries to be built within and around congested urban districts. The following standards adopted in India are recommended for the design of new major urban and rural arteries in other countries of the region. The standards provide for a right of way of 60 metres (200 feet) including a central verge of 6.60 metres (22 feet), a roadway of 7.20 metres (24 feet), another verge of 3.60 metres (12 feet), a service road of 7.20 metres, a footpath, a cycle track and a second footpath of 2.40, 2.70 and 3.60 metres (8 feet, 9 feet and 12 feet) respectively, the same arrangement being repeated on the other side of the central verge.[10] In major arteries, access from service roadways to the through dual roadway is limited to points about half a mile apart. An example of application of such standards is the road built around Delhi.

171. Reservation of sufficient right of way to serve future needs should be emphasized in all comprehensive master town plans for major cities in the region. Such plans should be drawn only after thorough study of present and projected traffic volume and should allow for the orderly growth of all urban and suburban districts. Provision for all existing and projected roads and streets for right of way should be marked on the plans, and appropriate legislation should make it possible to prohibit or control the erection of new buildings on land so marked. Regulation is essential if growing urban areas in the region are to be saved from traffic congestion such as now chokes most European cities. The effect of inadequate planning is apparent in the central districts of cities like Hong Kong and Bangkok, and constitutes a serious warning.

[10] The former requirement of 45 metres (150 feet) proved insufficient.

V. TRAFFIC OPERATION

A. Road signs, signals and markings

172. Traffic control signs, signals and markings are becoming increasingly necessary for regulating and guiding traffic in countries of the ECAFE region. As a minimum measure, there should be intensive study and analysis prior to their installation, and proper application afterwards. Adequate, but not excessive, use of such aids has great value in regulating the orderly flow of traffic, and application of sound principles in the selection, installation and operation of traffic signals is of the highest importance. Misapplication of these principles has the reverse effect, resulting in delay and confusion and frequently in disregard of all control devices. This applies to most parts of the ECAFE region.

(1) Road signs

Type and purpose

173. Two principal systems of road signs, commonly referred to as the "European" and the "American" systems, are in general use at present. They have been adopted or followed in most countries in the world, with alterations to fit particular traffic conditions. In the European system, indications are given by means of symbols; in the American system, although symbols are used in some cases, chief reliance is placed on inscriptions. The shapes and the colours used for various purposes differ.

174. A survey of the existing situation with respect to the use of different systems in countries of the ECAFE region was given in the "Final Report of the Group of experts on Road Signs and Signals" (E/CN.2/119, 22 July 1952), submitted to the Transport and Communications Commission of the United Nations at its sixth session. The report stated, in part:

> "Road signs in this region have to overcome the problem of diversity of languages; therefore the use of symbols is general. The number of signs used is limited in order to avoid confusion and therefore the systems used by countries are comparatively simple. Signs giving definite instructions are limited almost exclusively to large cities.
>
> "So far as specific systems are concerned, countries in this region follow several different ones. Certain countries such as Iran and Thailand have introduced regulations based closely on the 1931 Convention. However, the European system as such does not appear to be used in many parts of this region. In India, Pakistan, Ceylon, Malaya, Australia and New Zealand, danger signs are generally the red hollow triangle surmounting a rectangular plate bearing the symbol and inscription.
>
> "In Australia the problem of achieving uniformity of signs among the individual states is under study.
>
> "Indonesia and Thailand have comparatively few signs and therefore have wider and earlier opportunity than other countries of the region for implementation of new proposals, should they decide to accept them.
>
> "Japan has had its own system, into which, since the end of the Second World War, danger signs of the American type have been introduced. Signs giving definite instructions and informative signs have not been changed, and their design in certain aspects resembles the European system".

175. Traffic signs should be installed only by the authority of a public body or officials with appropriate jurisdiction, and for the sole purpose of regulating, warning or guiding traffic. Commercial advertising should not be permitted on traffic signs or signals; extraneous matter should be eliminated for obvious reasons.

176. Signs should be used only where necessary and where justified by field studies. Signs are not needed to confirm well-known or universally recognized rules of the road, such as that requiring drivers to keep to the left (or right), but they are essential where special regulations apply at specific places or at specified times or where road hazards are not self-evident. They are also needed to give information as to highway routes, directions, destinations and points of interest.

177. According to the type of message conveyed to the driver, traffic signs are usually classified into the following three categories:

(i) Danger warning signs call attention to conditions that are potentially dangerous.

(ii) Regulatory signs give the highway user notice of traffic regulations applicable at a given place or on a given highway that would not otherwise be apparent. Disregard of such regulations constitutes a misdemeanour.

(iii) Information signs give route designations, destinations, directions, distances, points of interest and other geographical or cultural information.

Recommended standards

178. The 1953 Draft Protocol on a Uniform System of Road Signs and Signals contains detailed provisions regarding sign shapes, patterns, symbols and sizes, and was prepared with a view to their standardization on a world-wide basis.[11] The Economic and Social Council of the United Nations, by resolution 567 (XIX) of May 1955, requested governments to consider that the provisions of the Protocol were recommended practices when revising their systems of road signs and signals.

179. The following recommendations regarding shapes and colours of signs were made by the present Seminar for the purpose of promoting uniform standards within the ECAFE region.

(i) Shape

Sign shapes should be standardized according to their significance, as follows:

Warning sign. An equilateral triangle with one point upward, or a diamond consisting of a square with one vertical diagonal.

Regulatory sign. A round shape with an inclined bar.

Information sign. A square or other rectangular shape.

(ii) Colour

Warning sign. White, light yellow or yellow background with red border; symbols should be black or a similar dark colour.

Regulatory sign. White background with a red border; symbols should be black or a similar dark colour. The border of the disk and the inclined bar should be red.

Information sign. White background with black lettering.

(iii) Size[12]

Triangular sign. The length of each side should be 90 centimetres (36 inches).

Diamond-shapes sign. The length of each side should be 60 centimetres (24 inches).

Round sign. The diameter should be 25 centimetres (10 inches) in cities or built-up areas, and 40 centimetres (16 inches) in rural areas.

(iv) Symbols

Where practical, the sign should use symbols rather than words to convey its message. The symbols should be those listed in the Protocol.

(v) Word messages

Most messages, particularly those on regulatory and information signs, cannot be conveyed adequately by symbols; word messages should be as brief as possible.

(vi) Lettering

Sign lettering should be clear and distinct. (Some experiments have been conducted in Japan with respect to the visibility and legibility of letters for signs).

(vii) Illumination and reflectors

Signs that convey messages of warning, important regulations or essential directions are as necessary by night as by day.

It is strongly recommended that all warning signs, including railway crossing signs, stop signs, other regulatory and guide signs with the exception of those for urban parking, should be illuminated or equipped with reflectors. Inadequate illumination and warning devices for central islands, shelters and obstructions due to road work are a major cause of accidents; it is particularly important for minimum uniform standards to be adopted in this respect.

(2) Signals

Purpose and classification

180. Traffic signals include all mechanically operated traffic control devices to warn traffic or to direct specific action. If properly operated and co-ordinated, they promote the orderly movement of traffic, reduce the frequency and number of accidents at particular locations, provide for a nearly continuous movement of traffic at a definite speed along a given route, and control heavy traffic at regulated intervals to permit other pedestrian and vehicular traffic to cross.

181. Traffic signals may be classified as follows:

(i) Traffic control signals, including fixed-time signals and traffic-actuated signals. The latter may be further subdivided into fully traffic-actuated, partly traffic-actuated and speed control signals;

(ii) Special pedestrian signals;

(iii) Flashing beacons and signals;

(iv) Train approach signals.

Uniformity

182. The need for uniform control devices in countries of the region has been pointed out in section I of the present report. The use of traffic signals is likely to develop considerably in the ECAFE region, and standardization of design and operation is necessary for satisfactory enforcement and safety education. The use, design and location of signals in the region should be based on similar principles. Practices in the United States and European countries, however, cannot be applied without modification to the mixed traffic conditions prevailing in the area. There is an urgent need for co-ordinated investigation and research to ascertain the need for signals suited to mixed traffic conditions.

Common specifications

183. Careful consideration should be given to traffic light installations; without adequate prior study, such controls may defeat their purpose. The advice of qualified experts should be obtained, and the diversity of conditions in rural

[11] E/CN.2/119; E/CN.2/CONF.1/12, annex 1 and E/2387, 31 March 1953.

[12] These dimensions are recommended in the Protocol.

and urban areas taken into account. The following general standards were approved by the Seminar, subject to more detailed study and experiment in the countries of the region:

(i) Each signal face should have at least three lenses: red, yellow and green.[13]

(ii) The lenses should be arranged in a straight line and preferably in vertical position, in the following order from top to bottom (or from left to right): red; yellow; green; straight-through arrow; left-turn arrow; right-turn arrow; wait (or "don't walk"); walk.

(iii) The signal faces should be located so as to give drivers and pedestrians clear indication of the right of way.

(iv) The height of signal faces should be at least 2.40 metres (8 feet) and not more than 3 metres (10 feet) above the roadway, but where traffic has to pass under such signals, the recommended height is 4.80 metres (16 feet). In rural areas where speeds are high and maximum prominence is needed for indications to drivers, or where brilliantly coloured or illuminated advertising signs in a commercial area distract attention, there is no objection to the use of signals suspended directly overhead.

(v) The display of unauthorized signs or other devices which reduce the effectiveness of traffic lights should be prohibited. Such a prohibition is particularly necessary in many countries of the ECAFE region.

Relative advantages of fixed-time and traffic-actuated signals

184. The two principal types of traffic control signal are fixed-time and traffic-actuated signals, and each has certain advantages over the other. The choice of equipment should be made only after careful review.

185. With fixed-time control signals, a consistent and regularly repeated sequence of signal indications is given to traffic. This regularity of timing is both an advantage and a handicap. It does not recognize short-term variations in traffic flow, and may result in a waste of time when traffic on one street is required to wait even if there is no traffic on the other street. When this occurs frequently, the total loss in time is considerable and the capacity of the intersection is reduced. However, over extensive areas where high traffic density calls for fixed-time signals, the length and timing of the cycle may easily be modified according to predetermined timing programmes set up on multiple-dial controls. This process is of great value and is most often used in co-ordinated or synchronized signal systems (simple and flexible progressive systems are described below).

186. With traffic-actuated control signals, the cycle is not predetermined, and intervals are adjusted by the mechanism, within certain limits, to fit the needs of traffic. This system is more flexible. Intersections may have partly traffic-actuated or fully traffic-actuated control; where a right of way is necessary on a major street, self-actuated signals may be necessary only on the minor street. Fully traffic-actuated signals are recommended for complicated intersections.

187. A fixed-time control system is simpler and less expensive. It provides positive speed control and is more easily maintained and serviced. It is relatively flexible when used with multiple-dial controls. Traffic-actuated controls may be regulated in accordance with the changing demands of traffic; delay and inconvenience are not so great. In progressive systems, such controls regulate special conflicting movements, particularly those which vary at different hours. The safety advantages are retained during periods of low volume, whereas fixed-time signals must often be switched to flashing operation during such periods to avoid unnecessary delay. Traffic-actuated control may minimize the tendency to avoid signal-controlled intersections; this may result in more logical routing.

Co-ordinated movement

188. The use of traffic signals for co-ordinated or synchronized movement may be of extreme value in moving vehicle groups and effectively regulating their speed, resulting in less delay and greater convenience and safety for both vehicles and pedestrians entering the roadway at intermediate intersections which are not controlled.

189. Co-ordinated systems are of two types:

Simple progressive system. The length of the cycle between successive intersections is set up according to a predetermined and unvarying timing schedule;

Flexible progressive system. The length of the cycle between intersections may be modified according to a number of predetermined timing programmes established to favour various traffic patterns, such as morning peak, afternoon peak and off-peak traffic. Flexibility is obtained through interconnexions of all controls with a master control having multiple-dial equipment.

Pedestrian signals

190. Sites for pedestrian signals must be carefully chosen; they should be erected only at selected junctions where the density of vehicular and pedestrian traffic is great or where the heavy turning movement of vehicles requires separate pedestrian control for the protection and convenience of pedestrians.[14]

191. Pedestrian signals may also be required at other places, such as factory entrances or schools, but special signals should not be installed where school patrols may be used effectively or where pedestrians may be directed to

[13] The Seminar did not approve the elimination of the yellow lense, as proposed by some authorities. Lettering on the lenses was not recommended; this did not apply to pedestrian signals, however.

[14] Studies have been made in Japan on the speed and flow of pedestrians at crossings to ascertain where such signals are needed.

sites controlled by signals. Special pedestrian signals or extra crossings should generally be provided only at selected points. They should be located only on sections of road where visibility is unimpaired. Zebra markings are recommended for pedestrian signals, which should be easily readable and understood by pedestrians and drivers.

192. A central refuge or safety island for pedestrians is recommended on roads where the available width for vehicular traffic is more than 12 metres (40 feet). It should be clearly illuminated; flashing beacons and overhead lighting are recommended.

Railway crossings

193. Signals are inadequate protection at railway crossings where highway traffic is heavy, train movements are frequent or visibility is poor. The use of approach signals with or without automatic gates or half-barriers is recommended. Devices used in Japan might serve as a basis for a uniform system of signals for railway crossings in the region.

(3) Road markings

194. Road markings are a very important feature of traffic control. In some cases they supplement other devices, such as traffic signs or signals, but in many cases they are the sole method of control. They have definite limitations, since they may be obliterated by traffic wear or by matter on the road's surface, unless they are frequently renewed.

Standardization

195. The Seminar noted the wide variance in standards for road markings in many areas of the region. It considered that such markings are as important as signs; the wide variety of markings in use minimizes their effectiveness and causes confusion. In many such cases, police enforcement appears unjustified. Because of this and because of ignorance of their purpose, road markings are not always followed or enforced.

Materials and application

196. The benefits of road markings can be obtained only when good quality paint is used and frequently renewed. White or yellow paint is most commonly used, although the initial expenditure is greater, the use of reflector paint of good quality has proved economical over a period. The Seminar noted various advantages in the use of such paint and recommended that further information on the subject should be provided to countries of the region. A report on the use of plastic paint would also be of value.

197. In view of the economy in labour and the speed of operation, which generally results in less disturbance of traffic, it was recommended that mechanical appliances should be used in painting lane markings and centre lines.

Recommended standards

198. The Seminar recommended that uniform standards for road markings, following the general principles laid down in the 1953 Draft Protocol on a Uniform System of Road Signs and Signals should be adopted by countries in the ECAFE region.[15] On the request of the Economic Commission for Europe (ECE) a policy of uniform road markings was prepared by a joint committee of experts representing the World Touring and Automobile Organization (OTA) and the Permanent International Association of Roads Congresses (PIARC) on the basis of principles contained in the Protocol. This document, which includes a draft agreement and attached instructions for detailed specifications, was to be submitted to the Inland Transport Committee of ECE; though not yet adopted, it might be used as a basis for evolving uniform standards for the ECAFE region. A draft agreement for the ECAFE region, together with specifications and sketches, is given in annex VI to the present report. It provides for the three following classes of marking:

(i) Longitudinal markings, indicating centre lines, border lines, lane lines, restricted overtaking, change in width of the travelled way and approach to obstacles.

(ii) Transverse markings, indicating stop lines, pedestrian crossings and cyclist crossings.

(iii) Other markings, consisting of arrows for segregation of turning movements, oblique parallel lines, parking space limits and word markings.

B. Movement restrictions and other regulations

(1) One-way streets

199. The Seminar was of the opinion that properly signposted and controlled one-way streets are beneficial to the general traffic flow but that one-way streets should be designated only after careful study and analysis. One-way streets are already common practice in some large cities in the region. In Tokyo, practically all streets other than major avenues in the central business district of the Ginza are one-way.

200. One-way streets eliminate most delays due to turning movements at intersections; their advantages and disadvantages are listed below.

(a) Advantages: (i) Road capacity is increased; (ii) average speed of traffic is increased; (iii) certain types of accidents are reduced; (iv) pedestrian movement is facilitated; (v) large expenditures or new facilities are not required; (vi) the amount of necessary police control is reduced; (vii) additional parking space may be provided.

(b) Disadvantages: (i) Motorists may have to travel farther to reach their destination; (ii) a large member of additional traffic signs are required, if there are numerous intersections; (iii) traffic accidents due to greater speeds may

[15] ECE document, E/CN.2/119.

increase; (iv) business establishments may suffer a loss; (v) it may be difficult to route and operate public transport facilities.

201. The following considerations may warrant a change from a two-way to a one-way street:

(i) The road width is insufficient to permit parking on both sides with a minimum of two lanes for traffic movement;

(ii) A nearby parallel street or alternative route can accommodate the opposite movement of traffic;

(iii) Complex intersections and areas;

(iv) There is congestion in two-way operation, such as in the streets forming the periphery of a public square;

(v) Where special events or circumstances attract an abnormal volume of traffic which cannot be readily accommodated by two-way operation.

(2) Through routes

202. The primary function of a through route is to concentrate and facilitate through traffic on one route, removing it from areas which are less suited to fast through traffic. Its advantages and disadvantages may be briefly summarized as follows:

(a) Advantages: (i) Delays to through traffic are reduced; (ii) accident frequency on all affected routes may be reduced; (iii) traffic capacity is increased owing to better control; (iv) conditions in adjacent areas are improved.

(b) Disadvantages: (i) Increased speed may result in higher frequency of more serious types of accident; (ii) vehicular and pedestrian cross traffic may be delayed for long periods during the peak traffic flow.[16]

203. A through-street should be carefully planned after study of accident records, traffic volume, and origin and destination surveys. The use of pairs of selected one-way streets as through-streets is practical; they will often accommodate heavy traffic and eliminate the necessity for widening streets.

(3) Prohibiting some types of vehicles from entering certain districts

204. Congestion of vehicular and pedestrian traffic because roads are inadequate for the volume of traffic may make it advisable to prohibit certain vehicles from entering selected districts, such as business areas, places of public entertainment and main thoroughfares where slow-moving traffic adds to the congestion and results in delay and obstruction to other traffic.

205. Prohibition of slow-moving vehicles in selected areas is recommended to improve traffic flow and reduce accident risk. Alternative parallel routes are recommended for the general improvement of the traffic flow.

206. The Seminar strongly recommended that selected areas should be set aside for taxis picking up passengers, and that taxis should be prohibited from picking up or discharging passengers in certain sections of road in business areas where congestion is great and the speed of traffic is seriously affected. Goods vehicles and other vehicles engaged in loading and unloading should not be permitted in congested areas at peak periods; time limits are recommended if conditions appear to justify such a prohibition. Although disadvantages may be experienced by vehicles so restricted, the great advantage to the majority of road users justifies such action.

(4) Other regulations

207. Other restrictions may be imposed on traffic when existing conditions warrant. Among them are speed limits and the restricted use of horns.

208. The question of speed limits is complex, and is mentioned only briefly in this report. It concerns the entire policy of traffic control and should be studied in conjunction with plans for highway improvement and enforcement possibilities. In no case, should speed limits be set without careful traffic study and accident analysis. Speed limitation is undoubtedly an efficient means of controlling the flow of traffic and checking reckless driving in rural and in urban areas. Absolute speed limits are fixed in some countries of the region, as for instance, in the Philippines, where passenger cars are restricted to 70 kilometres per hour and trucks and buses to 50 kilometres per hour. These limits are sometimes supplemented by special speed zones in built-up and outlying areas; their efficiency obviously depends upon strict enforcement. The Seminar agreed that the question of speed limits as part of highway safety programmes, should be the subject of extensive co-ordinated research before principles and standards are established for the region.

209. As to restricting the use of the horn, many American and European cities which have forbidden the blowing of horns within city limits report beneficial effects; reduction in noise reduces the strain on drivers as well as on others. Although traffic regulations in the ECAFE region usually admonish drivers to avoid the unnecessary use of the horn, there is generally insufficient enforcement. Horns are particularly noisy in Tokyo, and a nuisance to everyone; restricting the use of the horn would probably not have a detrimental effect on the speed of travel.

C. Parking and loading regulations

210. Parking constitutes a complex problem which varies with the area. In many countries of the ECAFE region, the parking problem is not great at present, but careful planning is required to take account of the trend towards an increased volume of traffic. In many large cities and suburban areas, the parking problem is becoming acute, and it is recommended that a careful study should be

[16] This disadvantage would not apply to expressways or freeways.

undertaken with a view to providing adequate off-street parking. Parking and traffic problems cannot be separated; as traffic and congestion increase, the authorities are forced to prohibit parking on major traffic routes. In many cases, this has already been done.

211. It is not intended to deal comprehensively with this subject in the present report. The Seminar recommended that areas should be carefully studied with respect to existing practices and parking space supply and demand, and that regular surveys should be made for comparative purposes.

212. The following principles were considered by the Seminar:

(i) Parking parallel to the kerb is the most desirable form of on-street parking from the standpoint of safety and efficient use of the width of the street.

(ii) Parking at an angle to the kerb is not advisable, and should be permitted only in special parking areas. Angle parking may be used in low-speed areas where parking requirements take procedence over the smooth operation of through traffic.

(iii) Parking does not include loading and unloading passengers or goods.

(iv) Off-street parking facilities should be provided wherever possible; in new building, provision should be made for adequate off-street parking to accommodate the vehicles involved.

(v) Adequate facilities should be provided for loading and unloading of goods vehicles; wherever possible, such facilities should be off-street.

(vi) In business areas, parking priority over private vehicles should be given to taxis and other means of public transportation.

(vii) Qualified experts should be consulted regarding the design and operation of parking lots and garages.

(viii) Parking meters, properly installed and adequately policed, reduce the duration of parking and provide greater parking capacity and more orderly parking.

(ix) Improper enforcement reduces the effectiveness of parking and loading regulations.

D. Public transit facilities

213. Adequate public transport facilities provide a definite means to improve general traffic control; they can lower the number of private passenger vehicles, and thus reduce the problems of parking and congestion. The space occupied by passengers in trams and buses, for example, equals approximately four square feet per person; in passenger motor-cars, particularly large United States cars, the area is obviously greater.

214. Although this subject is not fully covered in the present report, the Seminar made the following recommendations:

(i) Selection of public transport routes requires careful consideration.

(ii) Selection of terminals and bus and tram stops should be made after careful study; bays should be provided for buses picking up and discharging passengers wherever possible in order to reduce obstruction to through traffic.

(iii) Pedestrian islands or refuges for tram passengers should be erected only after careful study, and they should be clearly visible to approaching motorists by day or night. Illumination of these islands and approach markings are most important; they are inadequate in many areas and constitute a serious potential accident risk.

(iv) In a large number of cities throughout the world, trams have been replaced by trolley buses and other types of buses. Trams are not efficient and should be replaced whenever possible.

(v) Except on dual-road ways, stopping places at opposite sides of the road should be eliminated to minimize obstruction to other traffic; stops should be located so that vehicles on either side of the road, after stopping, proceed away from one another, not towards one another.

(vi) Stopping places should not be located on the approach side of pedestrian crossings.

(vii) Stopping places should be located so that vehicles using them do not block the vision of drivers emerging from side streets and other openings into the roadway.

(viii) Stopping places should not be abreast, nor curtail islands or refuges, nor cause traffic to cross a continuous barrier.

(ix) The use of queue barriers, refuges or shelters for public transport should be encouraged.

VI. ECONOMIC ASPECTS OF TRAFFIC DESIGN AND OPERATION

A. Benefit-cost analysis

215. In studying road projects the benefits to be derived from a project must be compared with its cost. If based on precise economic criteria, this comparison is of considerable value in determining the priority of the order of work in a comprehensive programme as well as in selecting the best individual project. The definition of economic criteria and standards for computation are thus of prime importance to all organizations concerned with road construction and operation.

216. It is difficult to assess the economics of a project from the point of view of the general economy of the nation, because a number of factors which are often difficult to evaluate accurately must be taken into account and because the effects of improved traffic conditions on the general economy are very complex, involving questions of the usefulness of transport, the profits of carriers, the incidence of taxation, the proportion of local trade affected and competition between different means of transport.

217. It is relatively easy to assess the general advantages of a project for road users by evaluating savings on the basis of users' gains and losses. This method may be adopted for studying the usefulness of a project before undertaking more detailed economic analysis. The method is known as benefit-cost ratio analysis, and may be defined as follows: a road project is considered useful when the users' "balance sheet" shows an annual saving clearly exceeding the current annual cost of the project plus any increase in maintenance costs. The ratio of savings to cost is an index of the usefulness of a project.

218. In establishing such an index, the following factors should be taken into account:

(i) Cost of right of way;

(ii) Highway construction or improvement costs, including the cost of bridges, drainage, other civil engineering works and administrative buildings;

(iii) Operating and maintenance costs during the useful life of the facility, based on forecasts of future traffic;

(iv) Cost of improving dependent works and installations, with allowances for useful life expectancy between periodic improvements;

(v) Normal rate of interest, or actual rate in the case of a loan or bond issue;

(vi) Passenger transport and freight haulage costs based on traffic volume forecasts for a period of ten to fifteen years. Transport and haulage should cover all motor transport costs, including depreciation and replacement of motor vehicles, interest charges, fuel and lubrication, maintenance and repairs, tires and spare parts with restricted useful life expectancy, expected wages of operating and maintenance chargeable to corresponding categories of the motor fleet,

(vii) Losses and expenses incidental to accidents;

(viii) Safety, time-saving and comfort equipment.

219. The current annual cost should be computed on the basis of the useful service life of the facility and the usual prevailing rate of interest. It may be advisable to divide major projects into parts with different life expectancies, such as land acquisition, earthwork, bridges and pavements. For most projects, however, a useful life of thirty to forty years can be expected; this implies annual instalments of 6 to 7 per cent of the capital cost (with interest at the rate of 5 per cent per annum). The current annual cost should include proportionate allowances for interest if the period of construction extends over one year, and increased operating costs and other losses to road users during construction because of detours, limited speed on work sites and similar factors.

220. Under the heading of users' gains and losses, the main item is a saving in the cost of operating motor vehicles, which can be estimated from average operating costs per kilometre established for different types of vehicle and different types of road. As indicated above, average operational costs take into account depreciation, maintenance and repairs and operating expenses, including expenditure on fuel, oil, tires, spare parts and, where applicable, wages of operators.

221. Although few studies to ascertain average operating costs have been undertaken so far in the ECAFE region, extensive data were collected in Japan in 1953 for typical vehicles and three types of road surface (unimproved gravel roads, improved gravel roads and paved roads). The estimates are summarized in table 7, and more detailed computations for trucks, buses and passenger cars are given in annex VII.

Table 7. Japan: Average Cost of Operating a Motor Vehicle

(Yen per kilometre)

Type of vehicle	Unimproved gravel road	Improved gravel road	Paved road
Truck:			
Large, diesel	66.55	51.05	35.17
Ordinary, petrol	63.96	49.86	34.76
Small	41.87	33.68	23.30
Passenger vehicle (petrol)	70.98	56.43	38.49
Bus:			
Ordinary	49.30	39.39	25.66
Small	37.99	31.33	21.32
Two-wheeled vehicle	7.27	6.26	5.23

Source: Government of Japan, *Engineering and Traffic Aspects of Highway Safety* (February 1957), p. 100.

222. Road users generally select itineraries on the basis of comparative travel time. Saving in time is difficult to estimate, however, because it differs widely with individuals and circumstances. Time saved is, of course, not always effectively used, and assessment of the value of time saved must be approached with caution to avoid overestimating its benefits. In the ECAFE region, where the greater part of traffic consists of commercial vehicles, possible savings in time undoubtedly have substantial economic value. In estimating the value of time to passengers on motor-cars and buses, the method used in Japan may be considered conservative, since only a part of the time saved is assumed to have economic value. The detailed method of computation is given in annex VIII.

B. Evaluation of losses due to traffic accidents

223. Although one cannot evaluate human suffering, it is possible to estimate some of the economic loss due to traffic accidents. For purposes of calculating benefits to users of a projected road, or to the country as a whole, losses may be classified as follows:

(i) Evaluation of property damage and financial loss subsequent to injuries and fatalities;

(ii) Assessment of intangible losses caused by bodily injuries or loss of life.

224. Most insurance companies have compiled average cost figures on the basis of statistical data, for the purpose of regulating compensation payments for different types of property damage and bodily injury and determining compensation payments to the family in case of death.

225. In assessing intangible losses resulting from serious bodily injury or loss of life, account should be taken of damage suffered by a community through depletion of its manpower capital of useful members or potentially useful ones (children).

226. The method commonly used in Japan for detailed evaluation of annual losses due to injuries and fatalities assumes a productive age of fourteen years and takes into account the rate of unemployment and the proportion of of persons actually working in the population of productive age. Property damage is estimated from accident reports. Some of the figures for 1955 are shown in table 8, which indicates the major economic loss due to fatalities. Average costs shown in the table may be used in assessing the benefits to road users of projected new construction or improvements. Because it is desirable to assess safety benefits accruing to road users, similar data on average costs of accidents, taking into account local traffic conditions and accident records, should be made available yearly in different countries of the ECAFE region.

Table 8. Japan: Losses caused by Traffic Accidents, 1955

Accident loss	Cost (millions of yen)	Percentage of total cost	Average cost per accident (thousands of yen)
Death	22,445	83.7	3,519.0
Injuries	2,509	9.4	32.8
Property damage	1,849	6.9	19.7
Total	26,803	100.0	—

Source: Government of Japan, *Engineering and Traffic Aspects of Highway Safety*, (February 1957), pp. 34, 35.

C. Benefits of road improvement to surrounding areas

227. Assessment of benefits limited to road users is relatively simple with application of the above-mentioned rules; when the benefits are estimated for wider group of persons, however, assessment becomes difficult though it is known that economic, social and cultural advantages accrue generally to the population of areas adjacent to a new road or improvement project. It may frequently happen in countries of the region that a new road is opened in an undeveloped area, making possible new agricultural or industrial developments and new settlements. Although the benefit-cost method is applicable, evaluation of benefits implies consideration not only of the users of the future road but of entire local economy. Since this subject has not yet been investigated in the ECAFE region and no statistical data are available, it was extremely difficult to assess the depth of penetration of these benefits, which depends on factors like the population density of the area of the existing road system, the economic characteristics of the area affected by the new scheme and local topography. It is, therefore, highly recommended that relevant studies should be initiated on this subject in countries of the ECAFE region.

D. The toll road problem

228. Some countries of the ECAFE region have found tolls a successful means of financing road and bridge construction. In Japan, in particular, a network of roadways is being built by a toll system under the authority of a public corporation. The Seminar thought, however, that in order not to overtax the highway user, toll roads should be constructed only if an existing toll-free road served the area. In that case, the additional tax levied in the form of a toll should represent only a small part of the benefit derived by road users from increased speed and comfort of travel and from reduced vehicle operating

costs, since the new facility would not otherwise attract a sufficient volume of traffic. Bridge tolls may be collected either where there was no former bridge connexion between two existing road sections, or where a new bridge replaces a temporary structure and provision of a new free bridge is only a remote possibility in the normal programming of works.

229. The Seminar recommended, as a principle to be strictly followed, that the construction of toll roads and bridges should be envisaged only in cases where the projected volume of traffic would ensure sufficient revenue from tolls fixed at a reasonable rate, to cover construction costs, interest on capital investment and operating costs during the economic life of the new or improved facility. In cases of financing through toll levies, the Seminar further recommended that a special agency or authority to administer the project should be established through appropriate legislation, whenever feasible.

E. Financing road projects

230. Methods of financing road expenditures vary widely in the ECAFE region owing to differences in economic levels and in traffic development; most of the countries are not financially able to appropriate adequate funds for maintaining and improving existing highways and constructing new roads. The Seminar, however, emphasized the necessity for a road budget with stable sources of revenues, sufficient to ensure at least adequate maintenance and a sound improvement programme.

231. Although some participants at the Seminar suggested that highway users should bear most, if not all, maintenance and improvement costs, the present stage of development in most countries in the region makes it necessary for the national general budget to carry part of the burden of road maintenance and construction. Only a substantial increase in traffic volume would enable road users to bear a greater share.

232. The Seminar therefore recommended that, in addition to road appropriations allocated from the general budget, a highway users' fund should also be created, if it did not already exist, in each country of the region from the following sources:

(i) Taxes levied on motor fuel and lubricants;

(ii) Taxes on tires and spare parts;

(iii) Registration fees for motor vehicles;

(iv) Other taxes collected from vehicle owners as taxes on road users.

233. Appropriate legislative action should be taken in each country to earmark the total, or a sufficient fixed part, of the revenue from these sources. The fund would constitute a stable and continuing source of appropriations for roads and would permit long-range programmes to be planned and realized. This policy would also have beneficial effects on costs.

234. As a supplemental source of revenue for road construction, the Seminar suggested study of the possibility of levying special lump-sum assessments on properties benefited by newly built or improved roads; the funds thus collected should be channelled by appropriate legislation into new construction and improvement of existing facilities.

VII. TRAINING, EDUCATION AND PUBLIC INFORMATION FOR TRAFFIC SAFETY

235. Highway transportation is an essential part of modern life and motor vehicles have brought about a peaceful revolution in customs, in business and social relationships, and in countless other respects. They have also raised the problem of traffic accidents and presented a challenge to make safer and more efficient use of highways.

236. Since the health, welfare and safety of the citizens is the direct concern of the government, primary responsibility for meeting this challenge rests with public officials. No public official can fail to face the fact that increasing numbers of drivers, cyclists and pedestrians are killed or injured in traffic accidents and that they must be made aware of their responsibilities for traffic safety.

237. The experience of many countries throughout the world has shown that the problem of road accidents requires long-range planning, a many-sided attack and sustained effort in the three principal fields of education, enforcement and engineering. The following may be used as a guide to a programme of education for school children and adults.

A. Requirements for driving licences for private and public vehicles

238. The licensing of motor vehicle drivers is a vital element in motor vehicle codes, and a great deal of educational work is required in this respect. "In the long run, and for the money spent, no other activity in a state has such an effect on preventing traffic accidents as a well-administered driver licensing system."[17] Driving a motor vehicle should be considered a privilege, not a right, which the federal, state or local government grants, and which it may deny, suspend or revoke for cause.

239. A driver's licence should not be issued to a person under a specified minimum age, nor to a person who is for any reason incapable of driving a motor vehicle safely. Each applicant should be required to pass certain tests: eyesight, ability to read and understand signs regulating, warning and directing traffic, knowledge of the traffic laws of the state or province and of city regulations, and demonstrated ability to exercise reasonable control in the operation of a motor vehicle.

240. Driver's licences should be issued for a limited period (possibly three years), and renewal on the expiry of that period should be required. Re-examination of licensed operators may be required by the licensing authority at its discretion, and appropriate action may be taken regarding the issuance of a new licence or the revocation of an existing one on the basis of such re-examination. A periodic physical and psychological examination may be required as a condition for the renewal of a driver's licence. No licence should be issued to a habitual user of narcotic drugs or to a person who is a habitual drunkard.

241. A driver's licence can and should be suspended or revoked for certain reasons, which may include the following:

(a) Unauthorized use of a licence.

(b) Conviction for manslaughter (or negligent homicide) resulting from the operation of a motor vehicle.

(c) Driving while under the influence of alcoholic liquor or narcotic drugs.

(d) Commission of a felony in which a motor vehicle was used.

(e) Failure to stop and render aid, as required by law, in the event of a motor vehicle accident resulting in death or personal injury.

(f) Convictions on a specified number (possibly three) of charges or reckless driving committed within a twelve-month period.

B. Education of children in traffic safety

242. Traffic safety education should be employed to reduce the incidence of traffic injuries and fatalities. For maximum effectiveness, a programme of traffic safety education should have a threefold purpose:

(i) Education of the school child: The child should learn to protect himself in the traffic he encounters, in a limited way at an early age, and in accordance with the broadening field of his activities as he grows older.

(ii) Education of the adult pedestrian: The pedestrian should be educated regarding his responsibilities as a component part of traffic, and he should be taught safe practices in walking. Adult education is discussed below.

(iii) Education of drivers is mentioned above.

[17] Department of Vehicles and Traffic of the District of Columbia, "Driver Licensing and Motor Vehicle Safety Inspection in the District of Columbia" (Washington, D.C., April 1957).

(1) Traffic safety education in elementary schools[18]

243. Traffic safety education in elementary schools should familiarize children at an early age with safe practices to escape various traffic hazards to which they are exposed in going to school and returning. The child crosses roads as a pedestrian, learns to cycle, and, in the school bus or with his family in a motor-car, is subject to the dangers of the road. He should be taught to realize these dangers and to cope with them by learning the rules of the road and recognizing traffic signs and signals. He should learn to respect the rights of others, to have consideration for them and to conduct himself in a manner which will prevent accidents. The child should be made safety-conscious from the time he starts carrying his books to school.

244. In teaching traffic safety to the youngest school children, colourful posters containing simple traffic safety slogans should be distributed monthly in large numbers so that all may be made conscious of them. Guides suggesting practical ideas for safe walking practices should be prepared. In this connexion, the Seminar suggested that the ECAFE secretariat, in co-operation with UNESCO, should take the necessary steps towards the preparation of education manuals on highway safety for inclusion in the curriculum of elementary and high schools and colleges. These manuals should present the essential rules of traffic and advice on safe behaviour, with the aid of illustrations and in a form best adapted to each group. Such manuals would be extremely useful to countries of the ECAFE region, where they could be translated into the language of the country and distributed among schools and colleges.

245. The following should prove helpful in teaching traffic safety:[19]

(i) Curriculum materials,[20] including lesson plans, covering (a) suggestions for co-ordinating traffic safety with other subjects; (b) traffic safety stories; (c) games that focus interest on traffic safety; (d) verses with traffic safety themes.

(ii) Poster contests: children draw posters illustrating safe traffic behaviour, and thus become more aware of specific practices and the importance of careful behaviour.

(iii) Films: traffic safety films should be shown in schools and to adult groups in the community.

(2) School Safety Patrols

246. In addition to the education of children regarding road safety, schools should take an active part in forming school safety patrols. The patrol is an organization of boys and girls selected from upper elementary grades and junior high schools to help school children avoid traffic accidents. Assistance may also be secured from boy scout organizations which train their members in highway safety measures. In no case, however, should these patrols be given duties which are normally police functions. Before serving on a patrol, a child should be required to obtain the parent's permission.

247. When a patrol programme has been authorized by school officials, teachers or principals select children to serve in the patrols, and a teacher to serve as patrol supervisor. Police officials and officers should give the patrol moral support and should also help in many practical ways in guiding and directing the programme. Patrol members should have no authority to stop motorists or to physically restrain children from crossing a street.

(3) Organizing a school safety patrol programme[21]

248. Community groups in school areas can effectively promote school traffic safety patrols, through joint action of school and police officials, community groups and parents. Patrol programmes are most effective where there is broad community co-operation.

Important steps in the initial planning of school safety patrols include:

(i) Formulating standard polices and procedures for operating the patrol.

(ii) Furnishing or helping to provide patrol equipment and training materials.

(iii) Giving recognition to efficient and faithful service.

(iv) Obtaining co-operation from vehicle drivers.

(v) Helping to inform the public opinion about the value and accomplishments of patrols.

249. In order to achieve uniformity in the organization of school safety patrols and to publicize traffic education for school safety programmes, a sponsoring organization should be created. A body of this kind may be organized along the following lines:

(i) *Suggested name and location*
"Highway Safety Committee", to be situated in the capital of the country.

(ii) *Purpose*
To conduct nation-wide education and public relations campaigns to ensure better driving and walking practices on the part of road users.

(iii) *Membership*
a. Common members: adult persons paying regular membership fees.
b. Supporting members: persons contributing support at irregular intervals.
c. Honorary members: persons lending moral support.

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[18] See, Burton W. Marsh, Director, Traffic Engineering and Safety Department, American Automobile Association, "Traffic Safety Education" (Washington, D.C., May 1957), pp. 3, 4.

[19] *Ibid.*

[20] Publications of the American Automobile Association recommended for consideration in this connexion are listed in annex III.

[21] For effective organization of school patrol programme, *How to Organize and Supervise a Safety Patrol*, published by the American Automobile Association, may be adapted to local conditions and used as a guide; see Burton W. Marsh, *op. cit.*, p. 6.

(iv) *Leadership*

The sponsoring organization, such as the "Highway Safety Committee", should be administered by a council, responsible for policy.

The council may be constituted as follows:

a. Representatives of government agencies concerned with highway safety, for example, the public works department, the traffic department of the ministry of communications, and the ministries of education, information, home affairs and public works.

b. Representatives of non-governmental agencies interested in highway safety; for example, automobile associations, insurance companies, motor manufacturers, petrol companies, drivers' associations and the Red Cross.

The council may elect a chairman and vice-chairman from among their members. It may also have an executive secretary, recommended by the chairman and appointed by the council, and a treasurer, recommended by the executive secretary and appointed by the chairman.

(v) *Organization*

a. The following may be a convenient organizational structure (see page 39).

b. The organization should be an incorporated body.

c. Subdivisions of the highway traffic safety committee may be established in every city or town, if approved by the council.

d. The organization of highway traffic safety sub-committees should conform to the policy of the highway traffic safety committee.

(vi) *Finances*

Funds for the organization may be obtained from membership fees, donations from private individuals or companies and contributions by public bodies.

(vii) *Rules*

Standard rules and regulations should be established.

C. Safety education for adults

250. The importance of an educational programme for adults cannot be over-emphasized, since they can be trained to appreciate the magnitude of the traffic safety problem and to become leaders in tackling it. Education of adults in traffic safety should take account of different phases of their activities: in driving cars which may be involved in accidents; as pedestrians who may be the victims or the cause of accidents; in training children in the principles and practices of safety; in guiding, directing and carrying out safety programmes; as individuals responsible for the adoption of traffic laws and regulations; and in providing the necessary funds to carry out sound and effective programmes of highway safety.

251. Recommended methods of adult safety education include the following:

(i) Use of radio, television, newspapers, business or industrial publications;

(ii) Production and showing of slides, film strips and motion pictures;

(iii) Use of safety slogans on postage stamps and wrapping paper;

(iv) Use of overhead banners across streets and standing billboards on the streets;

(v) Preparation, distribution and exhibition of newspapers, posters, pamphlets, leaflets and stickers in prominent places;

(vi) Posting of information notices showing: (a) The number of traffic accidents during a certain period of time; (b) the number of dead and the number injured by traffic accidents during a specified time; (c) photographs of actual traffic accident scenes.

(vii) Organization of traffic demonstrations and exhibitions during traffic safety weeks (material may include posters showing safe practices or warnings against accidents);

(viii) Use of home-circulating-boards as a means of extending public information;

(ix) Organization of training courses and round-table meetings;

(x) Organization of traffic safety training programmes for designated periods of time, for example, traffic safety weeks.

252. To prevent traffic accidents it is most important to spread safety education as widely as possible and to obtain public co-operation. For this purpose, it is desirable to appeal to various civic bodies for co-operation; these may include organized groups of owners of transport enterprises and private vehicles and drivers, as well as parent-teacher associations, women's groups, school authorities, press organizations and traffic safety associations.

253. In Japan, traffic safety associations operate as centres from which appeals are sent to various other civic bodies and to the general public for the purpose of carrying out safety education programmes. They may be briefly described as follows.

(1) Organization of traffic safety associations

254. A traffic safety association has been organized in each police precinct of Japan and includes drivers and owners of motor vehicles, owners of motor vehicle transport enterprises, and car manufacturers. These district associations are united to form a prefectural traffic safety association, which in turn belongs to the Japan Traffic Safety Association.

255. The officers of these associations are civilians. The prefectural governor or the prefectural chief of police formerly acted as officers, taking active charge of manage-

ment, but in order to strengthen the civilian character of the associations, the governor or chief of police currently serve only as advisers. The operating expenses of the associations are covered by membership fees and prefectural subsidies.

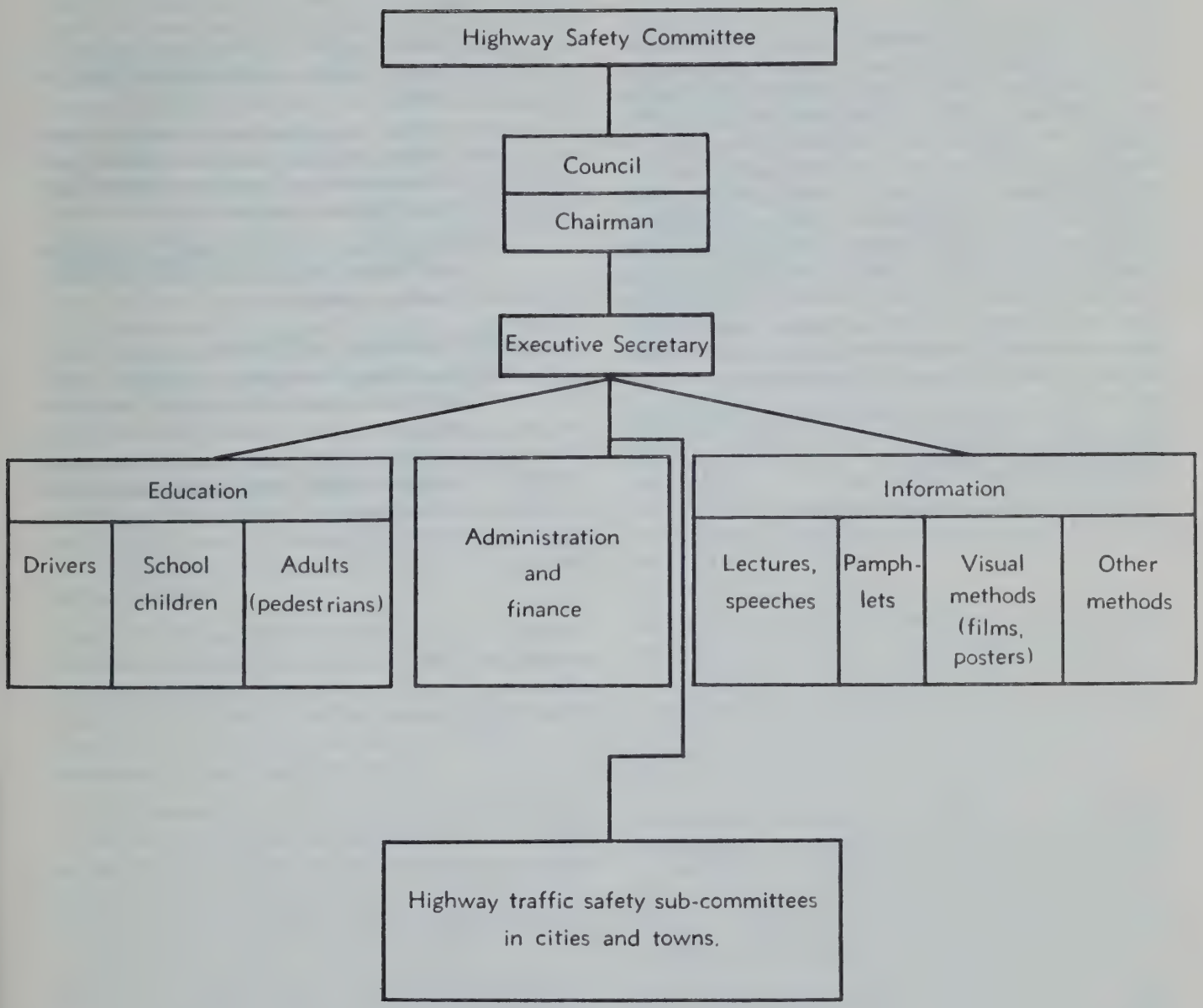
(2) Activities of traffic safety associations

256. The Japan Traffic Safety Association conducts ten-day nation-wide traffic safety campaigns twice each year, in spring and in autumn, in co-operation with the police. During these campaigns, the associations assist police officers in directing traffic, conduct drivers' training courses and round-table meetings, hold contests in driving techniques, publicly commend drivers with outstanding safety records, and conduct traffic safety institutes. Organizations of automobile drivers at every police precinct in the main prefectures and drivers' unions co-operate in the traffic safety campaigns.

257. Under the guidance of police officers, students in almost all junior high schools and grammar schools have organized self-governing traffic clubs (school patrols) to control traffic near schools and to safeguard lower grade pupils when crossing streets to and from school.

258. At several prefectural police offices, including the metropolitan police departments, automobile drivers with outstanding safety records have been commended. This has brought good results in encouraging safe driving and it is desired to spread the custom throughout the country. In the case of metropolitan police departments, the commendation extends to taxi-cab drivers who have not caused a traffic accident during a period of at least two years. These drivers are given a certificate, a badge and a sticker to be posted on the front windshield of his automobile. Of the 20,000 taxi-cab drivers in Tokyo, 2,745 have been commended.

259. It must be emphasized that a programme of education for traffic safety must be continuous if it is to be effective. Short, intense campaigns of a day, or a week, serve admirably to awaken public interest but they must be followed up consistently until traffic safety measures become an everyday habit.


Highway Safety Committee
Council
Chairman
Executive Secretary
Education
Drivers
School children
Adults (pedestrians)
Administration and finance
Information
Lectures, speeches
Pamph-lets
Visual methods (films, posters)
Other methods
Highway traffic safety sub-committees in cities and towns.

VIII. PROPOSAL FOR A WEEK OF STUDY OF TRAFFIC ENGINEERING PROBLEMS IN THE REGION

260. In view of the important results of the study weeks of traffic engineering that were organized in Europe in 1953, 1954 and 1956, it was suggested at the Seminar that a first study week of this kind should be organized for countries of the region along the lines of those held in Europe. Bombay was proposed as the meeting place for this group, which would meet in 1958 under the auspices of the ECAFE, in co-operation with non-governmental touring and automobile organizations and other associations concerned with highway traffic. Owing to exchange difficulties, attendance at such a meeting might not be as large as in Europe; the Seminar therefore proposed that financial aid should be sought from organizations interested in the economic development of the region.

261. It was suggested that this first study week could be concentrated advantageously on two subjects: accident studies and traffic operations.

1. Accident studies would include:
   (a) Traffic accident statistics: accident report forms, reporting procedures and filing of reports.
   (b) Analysis of accident causes: study of traffic accidents according to type of collision, type of vehicle, road conditions, driver's age, traffic violations and other factors.
   (c) Elimination of "black spots": experiment with various methods, and "before and after" studies assessing results.
2. Traffic operations would include:
   (a) Regulation of movement: systems of speed limits and speed zoning in rural and urban areas.
   (b) Studies and field measurements of intersection capacities under mixed traffic conditions in urban areas.

IX. CONCLUSION

262. It is impossible to draw a precise line between road safety and other aspects of traffic engineering. Owing to the close interrelation of the different factors involved, all measures to facilitate the movement of traffic usually have a beneficial effect on road safety. Some questions—for example, traffic laws and safety education—are specifically concerned with the safety aspect. The present report of the Seminar is not confined to these subjects, however, and the seven items selected for consideration by the Seminar constitute a broad review of essential problems related to traffic planning and operation, with special reference to conditions prevailing in the ECAFE region.

263. In all countries of the region, serious problems exist as a consequence of the rapid increase in motor vehicle traffic that has taken place in the past ten to twelve years. The result has been growing traffic congestion and an increased number of accidents throughout the area. Although traffic congestion and accidents are not new, and some successful methods of treatment have been evolved in Europe and North America after detailed and comprehensive studies, the findings in great part are not applicable to the ECAFE region. Thorough investigation and survey are called for before solutions in other areas can be adapted to local conditions.

264. The present report, therefore, cannot be expected to furnish ready-made answers to problems facing highway engineers and administrators in the region. It merely points to the type of information needed, stressing urgent requirements for studies and indicating methods of collecting and interpreting data on a comparable basis.

265. Responsibility for traffic safety is usually shared by several governmental units, including agencies for engineering and planning, for law and traffic administration and for enforcement, each having an important role to play. The quality of enforcement depends on the enactment of sound traffic laws and on police and court procedures.

266. It is of primary importance to take into account the traffic needs of the future. Evaluation of anticipated needs implies the use of several kinds of data, such as statistics on vehicle registration and fuel consumption, traffic counts and censuses and, when necessary, origin-destination studies.

267. The importance of a comprehensive and accurate accident record system cannot be over-emphasized, but comparable results can be achieved only if identical definitions are adopted and uniform methods of interpretation are ensured. In order to overcome the lack of reliable accident data, the present report makes recommendations concerning the reporting of accidents, the maintenance of records and the analysis of the causes of accidents.

268. Thorough knowledge of road and intersection capacity is of utmost importance for the selection of design standards. In most areas of the region, however, traffic includes a great proportion of slow-moving vehicles of all types, together with fast motor vehicles—a situation here referred to as "mixed traffic conditions". The results of studies conducted in Europe and North America should be adapted to take into account the delaying influence of slow-moving vehicles, and design standards should be fixed accordingly.

269. Also important from the safety viewpoint are traffic control devices. Standards for signs, signals and markings for the region are discussed, in particular, their colour, shape and location; the use of fixed-time, traffic-actuated and co-ordinated systems of signals; and specifications for road markings. The advantages and disadvantages of some methods of regulating traffic are also listed, including one-way streets, through-streets, and parking and loading regulations.

270. Because of the importance of economics in highway planning, the method of "benefit-cost ratio" is discussed, and examples are given of its application to the countries of the region. Assessment of benefits should take into account not only road users, but the welfare of the area as a whole. Recommendations are given on financing road projects and, in particular, on the possible use of tolls.

271. The subject of education and public information on road safety is also covered. It is emphasized that a driver's licence should be regarded as a privilege, to be suspended or revoked in case of serious or repeated traffic violations. Various means of teaching traffic safety to children and adults are considered, particularly the setting up of safety patrols and the organization of traffic safety associations.

272. During the closing meeting of the Seminar, organization of a study week of traffic engineering, on the lines of that recently held in Europe, was suggested. Tentative subjects for discussion are indicated.

273. An annex attached to the report gives detailed information on some of the aspects discussed and contains the standards for uniform road markings recommended by a committee of experts from the World Touring and Automobile Organization (OTA) and the Permanent

International Association of Roads Congresses (PIARC). 274. The report also refers to studies and research which the Highway Sub-Committee may wish to initiate. Among the subjects that body may wish to consider are the following:

(a) Whether preparation of a draft agreement to achieve uniform traffic laws and regulations in the region should be initiated and whether a preliminary survey of existing legislation should first be undertaken;

(b) Whether the methods and standards given in this report for traffic censuses, accident statistics and other studies can be adopted by all countries of the region and whether any modifications are necessary;

(c) Whether the recommendations for the execution in one and the same year of a co-ordinated traffic census in all countries of the region can be adopted;

(d) Whether a joint research project can be organized in the region to determine road and intersection capacities under mixed traffic conditions;

(e) Whether any further detailed studies should be initiated on other aspects not fully treated in the report;

(f) Whether the principle of a study week of traffic engineering for discussing these problems, to be held periodically with the participation of all countries of the region, should be adopted.

Annex I

List of participants

Representatives

Burma:
Mr. J. G. Simpson.

China, Republic of:
Mr. Y. Zien, Mr. C. M. Wang, Mr. P. Y. Woo.

India:
Mr. M. M. Chudasama, Mr. T. S. Khanna, Mr. N. Amanullah.

Indonesia:
Mr. U. Margono, Mr. H. S. Kivee, Mr. R. Slamet.

Japan:
Mr. M. Yoneda, Mr. K. Iwasaki, Mr. R. Tanaka, Mr. T. Takano, Mr. N. Okuda, Mr. H. Yamaguchi, Mr. T. Nakahara, Mr. K. Tanikawa, Mr. K. Hoshino.

Korea, Republic of:
Mr. K. Han, Mr. Y. Park.

Philippines:
Mr. R. Maslog, Mr. I. S. Ramos, Mr. Eduardo de los Santos.

Union of Soviet Socialist Republics:
Mr. N. F. Horoshilov, Mr. A. N. Mamin.

United States of America:
Mr. L. D. Wylie.

Other participants

Mr. A. Morrison (Traffic Police Headquarters, Hong Kong)

Mr. E. Kjajanegara (Keamanan Lalu-Lintas, Djakarta, Indonesia)

Mr. T. K. Ong (Ikatan Perusahaan-Perusahaan Otobis Seluruh Indonesia, Bandung, Indonesia)

Mr. K. Fujimori (Japan Highway Public Corporation, Tokyo, Japan)

Mr. N. Katahira (Japan Highway Public Corporation, Tokyo, Japan)

Mr. T. Yoshida (Overseas Construction Association of Japan, Inc., Tokyo, Japan)

Mr. T. Mori (Japan Roads Association, Tokyo, Japan)

Mr. K. Kondo (Japan Roads Association, Tokyo, Japan)

Mr. M. Ohsawa (Japan Automobile Chamber of Commerce and Industry, Tokyo, Japan)

ECAFE secretariat

Mr. M. S. Ahmad, Mr. Kavila na Chiengmai, Mr. S. Soubbotnik, Mr. J. Elkouby.

Annex II

Agenda

I. *Administrative structure and distribution of traffic safety responsibilities*

II. *Prediction of future increases in traffic and vehicle registration*
- Methods for traffic counts and censuses
- Analysis of vehicle registration trends
- Appraisal of present and future traffic needs

III. *Accident facts and their uses*
- Methods for recording and reporting accidents, filing accident statistics
- Analysis of causes of accidents
- Determination of accident "black spots"
- Beneficial effects of road improvements on road accidents

IV. *Capacity of roads and intersections*
- Factors affecting the capacity of roads in rural areas
- Capacity of intersections and urban roads
- Planning and design of various types of road and intersection design in relation to traffic volume

V. *Traffic operation*
- Traffic signs, signals and markings
- Restriction of movement of vehicles, by one-way streets, turn prohibitions, preferential streets, etc.
- Parking and loading regulations
- Enforcement procedures

VI. *Economic aspects of traffic design and operation*

Benefit-cost analysis and study in which probable annual cost of a proposed improvement is compared with the annual savings to road users due to the improvement

Beneficial effects of road improvement with respect to road accidents, fuel savings to road users in fuel, wear and tear on vehicles and savings in man-hours

Questions related to toll facilities

VII. *Training, education and public information for traffic safety*

Study of the psychology of road users

Road safety education for drivers, cyclists, pedestrians

Education in road safety at schools

Propaganda campaign for the enforcement of highway codes

Methods of assessing effects of public information and education on road behaviour

Annex III

List of documents

A. *Documents submitted to the Seminar*

ECAFE secretariat:

"Engineering Aspects of Highway Safety: Layout of Junctions and Other Aspects of Road Design in Relation to Highway Safety", (E/CN.11/TRANS/Sub.2/26, 28 May 1954)

"Traffic Aspects of Highway Safety", (TRANS/Sub.2/1, 15 November 1955)

AUSTRALIA:

Report from Department of Motor Transport, New South Wales

Report from Department of Government Transport, New South Wales

BURMA:

Government of Burma, "Traffic Problems in Rangoon" (May 1957)

CHINA:

Chinese delegation, "Slowing-Moving Non-Mechanical Vehicles"; "Road and Intersection Design in Relation to Traffic Volume"; "Traffic Markings, Markers and Signals"; "Report on the Problems of ensuring the Safety of Highway Traffic" (May 1957)

FRANCE:

J. Elkouby, Engineer of the Department of Highways and Bridges, Paris, "Findings of the Third International Study Week in Traffic Engineering", Stresa (1-6 October 1956)

INDIA:

Central Road Research Institute, "Road Traffic and its Control in India" (New Delhi, April 1957)

J. M. Trehan, Ministry of Transport (Roads Wing), "Planning and Design of various Road Types in India" (New Delhi, May 1957)

N. Amanullah, Assistant Engineer, Bihar Public Works Department, "Systematic Investigations and Proper Classification of Road Accidents by Traffic Engineers to ensure Highway Safety" (Patna, May 1957)

JAPAN:

Government of Japan, "Engineering and Traffic Aspects of Highway Safety" (February 1957)

R. Tanaka and K. Tanigawa, "Accidents on Railway Crossings"

Metropolitan Police Department, Tokyo, "General Report on the Motor Vehicle Driver's License Examination Station" (Tokyo, May 1957)

PHILIPPINES:

Bureau of Public Highways, Department of Public Works and Communications, "Notes on a Loadometer Survey in the Philippines; Traffic Law Enforcement; Road Traffic Control; Planning and Design of Various Road Types; Prediction of Future Traffic; Safety Programme" (Manila, May 1957)

UNITED STATES OF AMERICA:

Bureau of Public Roads, Department of Commerce, "Engineering in Highway Safety" (Washington, D.C.)

Department of Vehicles and Traffic of the District of Columbia, "Driver Licensing and Motor Vehicle Safety Inspection in the District of Columbia" (April 1957)

Maitland H. Bustard, Executive Director, National Committee on Uniform Traffic Laws and Ordinances, "Standards of Laws and Ordinances" (Washington, D.C.)

George Larsen, Jr., Traffic Institute, Northwestern University, "Police and Court Procedures as Related to Enforcement of Traffic Laws and Regulations"

Burton W. Marsh, Director, Traffic Engineering and Safety Department, American Automobile Association, "Traffic Safety Education" (May 1957)

UNION OF SOVIET SOCIALIST REPUBLICS:

Delegation of the Union of Soviet Socialist Republics, "Method of Cost and Economy Analysis"; "Forecast Methods for the Volume of Haulage and Density of Traffic"; "Highway Traffic Capacity" (May 1957)

B. *Literature on Highway Safety presented to the Seminar*

AUSTRALIA:

Australian Road Safety Council, *Annual Report, 1956*

Australian Road Safety Council, "Road Safety", *Current Affairs Bulletin* (Melbourne, vol. 12, No. 13)

Australian Road Safety Council, *The Australian Teacher's Road Safety Manual* (Melbourne, 1956) and safety poster

FRANCE:

Government of France, "Les Accidents corporels de la Circulation Routière en 1954"; "Les Accidents corporels de la Circulation Routière en 1955" (May 1957)

JAPAN:

Metropolitan Police Department, Tokyo, "Annual Report on Traffic Accidents"; "Psychological Testing of Motor Vehicle Drivers"; "Syllabus of Provisions for the Enforcement of Traffic Limitation" (May 1957)

Road Bureau, Ministry of Construction, "Roads in Japan" (May 1957)

UNITED KINGDOM:

Reports presented to the Public Works and Municipal Services Congress, (November 1956):

G. Charlesworth and T. M. Coburn, Road Research Laboratory, Department of Scientific and Industrial Research, *The Influence of Road Layout on Speeds and Accidents in Rural Areas*

F. Garwood and J. C. Tanner, Road Research Laboratory, Department of Scientific and Industrial Research, *Accident Studies Before and After Road Changes*

C. G. Giles and Barbara E. Sabey, Road Research Laboratory, Department of Scientific and Industrial Research, *Accident Reports and Skidding Accident Sites*

R. J. Smeed, Road Research Laboratory, Department of Scientific and Industrial Research, *Accident Rates*

C. G. Giles, Road Research Laboratory, Department of Scientific and Industrial Research, *The Skidding Resistance of Roads and the Requirements of Modern Traffic* (February 1957)

R. J. Smeed, Road Research Laboratory, Department of Scientific and Industrial Research, *Some Factors Affecting Visibility from a Driver's Seat and their Effect on Road Safety* (June 1953)

C. G. Giles and F. T. W. Lander, Road Research Laboratory, Department of Scientific and Industrial Research, "The Skid-Resisting Properties of Wet Surfaces at High Speeds", *The Journal of the Royal Aeronautical Society* (February 1956)

G. Grime and C. G. Giles, Road Research Laboratory, Department of Scientific and Industrial Research, *The Skid-Resisting Properties of Roads and Tyres*

G. Grime, "Vehicle Characteristics and Road Accidents—Effects of Design and Maintenance", *Engineering* (September 1954)

J. C. Tanner, "Accidents at Rural Three-Way Junctions", *The Journal of the Institute of Highway Engineers* (Westminster, SW1, 1953)

W. H. Glanville, Road Research Laboratory, Department of Scientific and Industrial Research, *Safety on the Road* (London, 1954)

R. J. Smeed, Road Research Laboratory, Department of Scientific and Industrial Research, "Road Design in Relation to Traffic Movement and Road Safety", *Journal of the Institution of Municipal Engineers* (September 1954)

J. C. Tanner and A. J. Harris, Road Research Laboratory, Department of Scientific and Industrial Research, *Street Lighting and Accidents — Some British Investigations* (1955)

F. H. P. Williams, Colonial Office, *Report on Roads and Road Problems in South East Asia and the Caribbean*

UNITED STATES OF AMERICA:

National Committee on Uniform Traffic Laws and Ordinances, *Uniform Vehicle Code and Model Traffic Ordinance*

Regional Safety Conferences of the President's Committee for Traffic Safety

American, Automobile Association, *Sportsmanlike Driving, third edition; Teacher's Manual for use with Sportsmanlike Driving; Student's Project Workbook for use with Sportsmanlike Driving; Objective Tests; Practice Driving Guides; Driver Education Equipment*

ETAT DE LA ROUTE ET DE L'ATMOSPHERE	DATE ET LIEU	

Col. 2 a 6

CADRE RESERVE

Indiquer ici le nombre de vehicules ayant participé a l'accident.

Annex IV

Accident report forms

A. France

FORMULAIRE STATISTIQUE D'ACCIDENT CORPOREL DE LA CIRCULATION ROUTIERE

A remplir pour tous les accidents corporels même s'ils ne donnent pas lieu a procedure.
Mettre une croix dans les cases interessées. — Les renseignements fournis sont confidentiels.
S'il y a PLUS de DEUX vehicules, utiliser la colonne "vehicule B" de formulaires complémentaires en annexe

Numero et date du P.-V. ou no et date de transmission du rapport du gardien.

Etabli par — Col. 7
1 ☐ Gendarmerie nationale.-Brigade.
2 ☐ Sûreté nationale.-Police-Commissariat, etc.
de ..... (localité où se trouve le bureau)

DATE ET LIEU

Col. 8
1 ☐ Lundi
2 ☐ Mardi
3 ☐ Mercredi
4 ☐ Jeudi
5 ☐ Vendredi
6 ☐ Samedi
7 ☐ Dimanche

Col. 9-10
Heure de l'accident: ..... H .....
Date de l'accident: col. 11-12, col. 13-14
.....

Departement:
.....
.....
Col. 15-16
No de code du departement où a eu lieu l'accident: .....

Commune où s'est produit l'accident:
.....
.....
Col. 17-18-19
No de code de la commune: .....
Col. 20
L'accident a-t-il eu lieu en agglomeration? 1 ☐ Oui 2 ☐ Non

Col. 21 Col. 22-23-24 et 25
1 ☐ Autoroute: .....
2 ☐ Route nationale no .....
3 ☐ Chemin departemt. no .....
4 ☐ Chemin vicinal no .....
5 ☐ Chemin rural no .....
6 ☐ Route stratégique ou forestière .....
7 ☐ ..... (rue, avenue, boulevard, etc.)

Col. 26 LOCALISATION
Col. 27-28-29 et 30
1 a 7 Si l'accident a eu lieu ☐ à un carrefour ou sur une place, preciser l'appellation
de l'autre route (ou de l'autre rue): .....
8 ☐ **Point kilométrique** relevé sur les lieux ou d'après la carte fournie par les Ponts et Chaussées: .....
No ou nom de l'immeuble voisin ou lieudit:
.....

ETAT DE LA ROUTE ET DE L'ATMOSPHERE

Col. 31
Accident survenu:
1 ☐ Sur trottoir, contre-allée;
2 ☐ Sur piste cyclable;
3 ☐ Sur passage "cloute";
4 ☐ Sur chaussée;
5 ☐ Ailleurs.

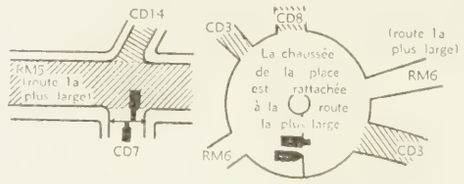
Col. 32-33-34
Largeur de la chaussée ou de la piste cyclable sur laquelle a eu lieu l'accident: ..... m .....

Col. 35 PLAN DES LIEUX
1 ☐ Intersection, carrefour (ou à proximité de).
2 ☐ Place (ou à proximité de).
3 ☐ Courbe (hors carrefour ou hors place).
4 ☐ Ligne droite sans carrefour.

Col. 36
1 ☐ Sommet de côte, dos d'ane.
2 ☐ Forte pente.
3 ☐ Passage retréci en permanence. Pont etroit.

TRES IMPORTANT.—La chaussée d'un carrefour ou d'une place est considerée comme appartenant a la route la plus large y ayant acces.

Exemples de délimitation de chaussées



Accident en carrefour sur CD7 — Accident sur RM6

CHAUSSEE OU PISTE

Col. 45 Nature
1 ☐ Béton de ciment.
2 ☐ Paves de pierre.
3 ☐ Empierrement non goudronné.
4 ☐ Goudron.
5 ☐ Enrobe (anti-dérapant).

Col. 46 Etat
1 ☐ Moullée ou humide
2 ☐ Huile ou betterave ou terre argileuse ou boue.
3 ☐ Verglacée.
4 ☐ Enneigée.
5 ☐ Gravillons, petite réparation.
6 ☐ Sèche.

Col. 47 Profil
1 ☐ Affaissement ou deformation. Tassement
2 ☐ Nids de poule, trous, ornières.
3 ☐ Travaux ou tranchée cuverte.
4 ☐ Chaussée très bombée.
5 ☐ Cassis, caniveau transversal.
6 ☐ Profil normal.

ATMOSPHERE

Col. 48 Lumière
1 ☐ Aube ou crépuscule.
2 ☐ Nuit sur route eclairée.
3 ☐ Nuit sombre.
4 ☐ Nuit claire, clarte lunaire.
5 ☐ Plein jour.

Col. 49 Intempéries
1 ☐ Brouillard.
2 ☐ Chute de neige, grêle.
3 ☐ Vent fort, tempête.
4 ☐ Pluie forte.
5 ☐ Pluie legère.
6 ☐ Pas d'intempéries.

NOTA.—Ne pas confondre l'état du revêtement et les intempéries.

REGIME DE CIRCULATION

Col. 37
1 ☐ Rue à sens unique de circulation (sans terre-plein central).
2 ☐ Chaussée à sens unique de circulation (avec terre-plein central).
3 ☐ Sens giratoir.
4 ☐ Chaussée à plusieurs sens de circulation.

Col. 38 Régulation
1 ☐ Signalisation lumineuse.
2 ☐ Police.
3 ☐ Sans signaux lumineux, sans police.

Col. 39
Présence de lignes jaunes délimitant sur la chaussée:
2 ☐ — 2 voies;
3 ☐ — 3 voies;
4 ☐ — 4 voies (ou plus).
On appelle "voie" la largeur de chaussée qui permet le passage d'une file de vehicules: 3 a 3,5 mètres.
5 ☐ Ligne jaune, axiale.
6 ☐ Pas de lignes jaunes sur la chaussée.

AMENAGEMENT

Col. 40
1 ☐ Presence d'un trottoir praticable.
2 ☐ Trottoir non praticable.
3 ☐ Accotement gazonne.
4 ☐ Pas de trottoir, pas d'accotement.

Col. 41
1 ☐ Présence de piste cyclable.
2 ☐ Pas de piste cyclable.

Col. 42
1 ☐ Présence d'un passage "cloute".
2 ☐ Pas de passage "cloute".

Col. 43
Passage à niveau gardé:
1 ☐ — barriéres ouvertes;
2 ☐ — barriéres fermées;
Passage à niveau non gardé:
3 ☐ — avec signaux automatiques lumineux;
4 ☐ Sans signaux automatiques lumineux
5 ☐ Voie ferrée sur route (paralléle).

Col. 44
1 ☐ Alignement d'arbres en bordure de la route.
2 ☐ Pas d'arbres.

ETAT DU CONDUCTEUR ET DU PIETON

VEHICULE A

Conducteur: Col. 50-51

Nom: ..... Age: .....

Profession: .....

Col. 55 NATIONALITE

1 ☐ Allemagne. 5 ☐ Suisse.
2 ☐ Belgique. 6 ☐ U.S.A.
3 ☐ G.B. 7 ☐ Autres.
4 ☐ Italie. 8 ☐ France.

Col. 52

1 ☐ Sexe masculin.
2 ☐ Sexe féminin.

Col. 56

1 ☐ Assuré.
2 ☐ Non assuré.

Col. 53

1 ☐ Auto-Ecole.
2 ☐ Non titulaire de permis de conduire.
3 ☐ En fuite avec vehicule heurté.
4 ☐ Titulaire du permis.

Col. 57

1 ☐ Infirmité, déficience physique permanente.
2 ☐ Sous l'effet de la boisson ou de stupéfiant.
3 ☐ Etait endormi.
4 ☐ Fatigue, malaise soudain.
5 ☐ Inattention, distraction, inexpérience reconnue.
6 ☐ N'était pas sur le vehicule au moment de l'accident.

Col. 54

1 ☐ Connaissant bien les lieux.
2 ☐ Passe rarement ou pour la première fois.

GENES

Col. 58

1 ☐ Ebloui par un vehicule non heurté.
2 ☐ Ebloui par le soleil.
3 ☐ Gene par vehicule arrête non heurté.
4 ☐ Gené par vehicule en mouvement non heurté.

Col. 59

1 ☐ Gené par piéton non heurté.
2 ☐ Gené par animal non heurté.
3 ☐ Gené p. obstacle non heurté.
Visibilite genée par:
4 ☐ — arbres, végétation;
5 ☐ — talus;
6 ☐ — construction.

ETAT DU VEHICULE AVANT L'ACCIDENT

Col. 60

1 ☐ Feux eblouissants.
2 ☐ Feux insuffisants ou manquants.
3 ☐ Avarie à l'indicateur de changement de direction.
4 ☐ Véhicule en surcharge.
5 ☐ Chargement dangereux.
6 ☐ Mauvais état général du véhicule.

Col. 61

1 ☐ Freins insuffisants ou défectueux.
2 ☐ Pneu crevé ou eclaté.
3 ☐ Perte d'une roue.
4 ☐ Direction rompue ou défectueuse.
5 ☐ Portière ouverte a l'arrêt.
6 ☐ Portière ouverte en marche.

7 ☐ Autre défaut du véhicule: .....

Vitesse estimée avant l'accident (si possible): ..... km/h

VEHICULE B

Conducteur. Col. 50-51 +

Nom: ..... Age: .....

Profession: .....

Col. 55 + NATIONALITE

1 ☐ Allemagne. 5 ☐ Suisse.
2 ☐ Belgique. 6 ☐ U.S.A.
3 ☐ G.B. 7 ☐ Autres.
4 ☐ Italie. 8 ☐ France.

Col. 52 +

1 ☐ Sexe masculin.
2 ☐ Sexe féminin.

Col. 56 +

1 ☐ Assuré.
2 ☐ Non assuré.

Col. 53 +

1 ☐ Auto-Ecole.
2 ☐ Non titulaire du permis de conduire.
3 ☐ En fuite avec vehicule heurté.
4 ☐ Titulaire du permis.

Col. 57 +

1 ☐ Infirmité, déficience physique permanente.
2 ☐ Sous l'effet de la boisson ou de stupéfiant.
3 ☐ Etait endormi.
4 ☐ Fatigue, malaise soudain.
5 ☐ Inattention, distraction, inexpérience reconnue.
6 ☐ N'était pas sur le vehicule au moment de l'accident.

Col. 54 +

1 ☐ Connaissant bien les lieux.
2 ☐ Passe rarement ou pour la première fois.

Col. 58 +

1 ☐ Ebloui par un vehicule non heurté.
2 ☐ Ebloui par le soleil.
3 ☐ Gené par vehicule arrête non heurté.
4 ☐ Gené par vehicule en mouvement non heurté.

Col. 59 +

1 ☐ Gené par piéton non heurté.
2 ☐ Gené par animal non heurté.
3 ☐ Gené p. obstacle non heurté.
Visibilite genée par:
4 ☐ — arbres, végétation;
5 ☐ — talus;
6 ☐ — construction.

Col. 60 +

1 ☐ Feux eblouissants.
2 ☐ Feux insuffisants ou manquants.
3 ☐ Avarie à l'indicateur de changement de direction.
4 ☐ Véhicule en surcharge.
5 ☐ Chargement dangereux.
6 ☐ Mauvais état général du véhicule.

Col. 61 +

1 ☐ Freins insuffisants ou défectueux.
2 ☐ Pneu crevé ou eclaté.
3 ☐ Perte d'une roue.
4 ☐ Direction rompue ou defectueuse.
5 ☐ Portière ouverte a l'arrêt.
6 ☐ Portière ouverte en marche.

7 ☐ Autre défaut du véhicule: .....

Vitesse estimée avant l'accident (si possible): ..... km/h

NOTA.—Les cycles tenus à la main, les voitures à bras, les landaux ne sont pas enregistrés en tant que véhicules.

Les animaux tenus en laisse ne sont pas considerés comme des obstacles.

Les usagers qui les dirigent doivent être recensés dans la colonne PIETONS.

PIETONS

Nom: ..... Indiquer GROUPE si plusieurs piétons.

Profession: .....

Col. V7

1 ☐ Infirmité déficience physique permanente.
2 ☐ Sous l'effet de boisson ou de stupéfiant.
3 ☐ Etait endormi.
4 ☐ Fatigue, malaise soudain.
5 ☐ Inattention, distraction.

Col. V8

1 ☐ Ebloui par véhicule non heurté.
2 ☐ Ebloui par le soleil.
3 ☐ Gené par véhicule arrête non heurté.
4 ☐ Gené par véhicule en mouvement non heurté.
5 ☐ Gené par piéton non heurté. ou par animal ou obstacle non heurté.

RESUME ou SCHEMA

Modèle 1957

NOTA.—Les numeros placés en marge sont des codes mécanographiques. Ils ne concernent pas les services de la police routière.

Tourner la page S.V.P.

J.U. 701425 (2209) ☐

NATURE DES VEHICULES

VEHICULE A

Col. 62-63

11 ☐ Voiture de tourisme (y compris taxi, voiture dite "commerciale", etc., même avec remorque-camping ou bétaillère).

13 ☐ Camionnette (poids maximum: = ou — 3,5 t.).

17 ☐ Camion (poids: + de 3,5 t.).

19 ☐ Autobus, autocar ou trolleybus.

23 ☐ Tracteur.

Col. 64

Pour ces vehicules seulement. Y avait-il en remorque?

1 ☐ — un engin agricole;

2 ☐ — une semi-remorque;

3 ☐ — une remorque.

29 ☐ Bicyclette sans moteur.

31 ☐ Bicyclette avec moteur auxiliaire, = ou — de 50 cm³.

37 ☐ Vélomoteur: de 51 à 125 cm³.

41 ☐ Scooter de 51 à 125 cm³.

43 ☐ Motocyclette ou scooter: + de 125 cm³.

47 ☐ Ensemble side-car.

Pour ces vehicules seulement: Y avait-il un occupant sur le siege arriere?

4 ☐ OUI

5 ☐ NON

53 ☐ Tramway.

59 ☐ Train, autorail, draisine.

61 ☐ Véhicule à traction animale.

67 ☐ Animal monté.

71 ☐ Autre véhicule (à préciser): .....

Col. 65-66

11 ☐ Se déportait à gauche pour dépasser un véhicule.

13 ☐ Dépassait à gauche un véhicule.

17 ☐ Se rabattait vers la droite après avoir dépassé un véhicule.

Col. 67

Si le véhicule A a fait une des manoeuvres ci-contre, préciser s'il était:

2 ☐ — en deuxième position;

3 ☐ — en troisième position.

19 ☐ Venait d'une autre route en virant à gauche.

23 ☐ Venait d'une autre route et traversait le carrefour.

29 ☐ Venait d'une autre route en virant à droite.

31 ☐ Quittait la bordure après stationnement.

37 ☐ Entrait sur la chaussée en venant d'un emplacement de parking, de garage ou d'une entrée particulière.

41 ☐ Venait se garer au long de la bordure.

43 ☐ Tournait à gauche pour quitter la route.

47 ☐ Tournait à droite pour quitter la route.

53 ☐ Suivait la route.

59 ☐ Autre manoeuvre: .....

61 ☐ Arrêté moteur en marche.

67 ☐ En stationnement.

Venant de ..... Allant vers .....

Col. 68-69

20 ☐ A traversé involontairement le terre-plein central.

30 ☐ Ralentissement ou arrêt brusque.

50 ☐ A fait un écart sur le côté.

70 ☐ A dérapé avant l'accident.

MANOEUVRES

VEHICULE B

Col. 62-63 +

11 ☐ Voiture de tourisme (y compris taxi, voiture dite "commerciale", etc., même avec remorque-camping ou bétaillére).

13 ☐ Camionnette (poids maximum: = ou — 3,5 t.).

17 ☐ Camion (poids: + de 3,5 t.).

19 ☐ Autobus, autocar ou trolleybus.

23 ☐ Tracteur.

Col. 64+

Pour ces vehicules seulement. Y avait-il en remorque?

1 ☐ — un engin agricole;

2 ☐ — une semi-remorque;

3 ☐ — une remorque.

29 ☐ Bicyclette sans moteur.

31 ☐ Bicyclette avec moteur auxiliaire, = ou — de 50 cm³.

37 ☐ Vélomoteur: de 51 à 125 cm³.

41 ☐ Scooter de 51 à 125 cm³.

43 ☐ Motocyclette ou scooter: + de 125 cm³.

47 ☐ Ensemble side-car.

Pour ces vehicules seulement: Y avait-il un occupant sur le siege arriere?

4 ☐ OUI

5 ☐ NON

53 ☐ Tramway.

59 ☐ Train, autorail, draisine.

61 ☐ Véhicule à traction animale.

67 ☐ Animal monté.

71 ☐ Autre véhicule (à préciser): .....

Col. 65-66 +

11 ☐ Se déportait a gauche pour dépasser un véhicule.

13 ☐ Dépassait à gauche un véhicule.

17 ☐ Se rabattait vers la droite après avoir dépassé un véhicule

Col. 67 +

Si le vehicule B a fait une des manoeuvres ci-contre, preciser s'il etait:

2 ☐ — en deuxieme position;

3 ☐ — en troisieme position.

19 ☐ Venait d'une autre route en virant à gauche.

23 ☐ Venait d'une autre route et traversait le carrefour.

29 ☐ Venait d'une autre route en virant à droite.

31 ☐ Quittait la bordure après stationnement.

37 ☐ Entrait sur la chaussée en venant d'un emplacement de parking, de garage ou d'une entrèe particuliére.

41 ☐ Venait se garer au long de la bordure.

43 ☐ Tournait à gauche pour quitter la route.

47 ☐ Tournait à droite pour quitter la route.

53 ☐ Suivait la route.

59 ☐ Autre manoeuvre: .....

61 ☐ Arrêté moteur en marche.

67 ☐ En stationnement.

Venant de ..... Allant vers .....

Col. 68 +

2 ☐ A traversé involontairement le terre-plein central.

3 ☐ Ralentissement ou arrêt brusque.

5 ☐ A fait un écart sur le côté.

7 ☐ A dérapé avant l'accident.

Col. 69 + VUE D'ENSEMBLE

2 ☐ Le véhicule B se déplacait en *sens inverse* du véhicule A.

3 ☐ Le véhicule B se déplacait dans *le même* sens que le véhicule A.

5 ☐ Autre cas.

OBSTACLE HEURTE

Col. 74 OBSTACLE HEURTE SUR CHAUSSEE

1 ☐ Obstacle heurte sur chaussée: arbre tombé, materiaux, fil tendu, etc.

2 ☐ Animal en liberté heurté sur chaussèe.

3 ☐ Troupeau heurte sur chaussée.

4 ☐ Barrière de passage à niveau heurtée.

Col. 75 OBSTACLE HEURTE HORS CHAUSSEE

1 ☐ Arbre.

2 ☐ Borne, poteau, lampadaire.

3 ☐ Murette, construction, talus.

4 ☐ Materiaux. Accotement accidenté.

5 ☐ Bordure de trottoir. Refuge. Animal en liberté.

Col. 76 PAS DE COLLISION

1 ☐ A quitté la chaussée involontairement.

2 ☐ A fait un tonneau, ou un tête à queue, ou à capote.

3 ☐ Chute d'un occupant.

4 ☐ Incondie du véhicule.

5 ☐ Autre genre d'accident.

PIETONS

Col. V1-V2

73 ☐ Personne tenant à la main un cycle, ou une voiture a bras, ou un landeau, etc.

79 ☐ Personne tenant un animal en laisse.

83 ☐ Gardien de troupeau.

89 ☐ Personne occupée a réparer un véhicule.

97 ☐ Piéton isolé ou groupe de piétons.

Col. V9 (a) ou la piste cyclable.

1 ☐ Etait sur un emplacement réservé aux piétons et interdit aux véhicules (trottoir, refuge, accotement, contre-allée).

2 ☐ Franchissait la voie du chemin de fer.

3 ☐ Etait tombé sur la chaussée (a) avant l'accident.

4 ☐ Etait descendu et s'éloignait d'un véhicule ou s'approchait d'un véhicule pour y monter.

5 ☐ Travaillait ou jouait sur la chaussée (a). Marchait sur la chaussée (a) dans le sens de la longueur:

6 ☐ — à gauche;

7 ☐ — à droite.

Traversait:

8 ☐ — perpendiculairement.

9 ☐ — en biais ou en diagonale.

	VEHICULE A	VEHICULE B	OBSTACLE HEURTE
FAUTES	Col. 70 1 ☐ Franchissement interdit d'une ligne jaune continue. 2 ☐ Circulait en recouvrant une ligne jaune discontinue bien qu'il n'effectuat pas un dépassement. 3 ☐ Circulait en dehors de la piste cyclable obligatoire. 4 ☐ Circulait en dehors de la chaussée.	Col. 70 + 1 ☐ Franchissement interdit d'une ligne jaune continue. 2 ☐ Circulait en recouvrant une ligne jaune discontinue bien qu'il n'effectuat pas un dépassement. 3 ☐ Circulait en dehors de la piste cyclable obligatoire. 4 ☐ Circulait en dehors de la chaussée.	Col. V10 1 ☐ Est descendu et s'est eloigné d'un véhicule, côté circulation, sans précaution. 2 ☐ A traversé en dehors du passage "cloute". 3 ☐ A traversé contrairement au signal (lumineux ou police). 4 ☐ A traversé sans précaution. 5 ☐ Ne se tenait pas sur l'emplacement reservé aux piétons. 6 ☐ Ne s'est pas rangé sur le bord de la chaussée. 7 ☐ Colonne de piétons demunie d'eclairage. 8 ☐ Autre infraction: .....
	Col. 71 1 ☐ A débouché sans précaution d'un parking, d'un stationnement ou d'une entrée particulière. 2 ☐ A dépassé à gauche contrairement au règlement. 3 ☐ A obliqué sans précaution. 4 ☐ N'a pas respecté la priorité d'un véhicule. 5 ☐ Tournant incorrect à un carrefour. 6 ☐ Stationnement sur chaussée interdit ou dangereux. 7 ☐ Cycliste se tenant à un autre véhicule. 8 ☐ Ne tenait pas sa droite.	Col. 71 + 1 ☐ A débouché sans précaution d'un parking, d'un stationnement ou d'une entrée particulière. 2 ☐ A dépassé à gauche contrairement au règlement. 3 ☐ A obliqué sans précaution. 4 ☐ N'a pas respecté la priorité d'un véhicule. 5 ☐ Tournant incorrect a un carrefour. 6 ☐ Stationnement sur chaussée interdit ou dangereux. 7 ☐ Cycliste se tenant à un autre véhicule. 8 ☐ Ne tenait pas sa droite.	.....
	Col. 72 1 ☐ Vitesse excessive dans les conditions existantes. 2 ☐ N'a pas observé la signalisation routière (fixe, lumineuse ou police). 3 ☐ N'a pas signalé sa manoeuvre (ou mal). 4 ☐ Autre infraction:	Col. 72 + 1 ☐ Vitesse excessive dans les conditions existantes. 2 ☐ N'a pas observé la signalisation routière (fixe, lumineuse ou police). 3 ☐ N'a pas signalé sa manoeuvre (ou mal). 4 ☐ Autre infraction:	
COLLISION	Col. 73 Partie du véhicule heurtée dans l'accident: 2 ☐ 1/3 Avant. 5 ☐ 1/3 Central gauche. 3 ☐ 1/3 Arrière. 7 ☐ 1/3 Central droit.	Col. 73 Partie du véhicule heurtée dans l'accident: 2 ☐ 1/3 Avant. 5 ☐ 1/3 Central gauche. 3 ☐ 1/3 Arrière. 7 ☐ 1/3 Central droit.	Col. V1 V2 Pietons
VICTIMES	Col. V1 V2 A Col. V3 / Col. V 4 Sexe / Col. V5 V6 / Col. V7 1 TUES ou décédés dans les 3 jours. 1 ☐ H. 2 ☐ F. Age: ... 1 ☐ Cond. 2 ☐ Pass. 2 BLESSES hospitalisés plus de 6 j. 1 ☐ H. 2 ☐ F. Age: ... 1 ☐ Cond. 2 ☐ Pass. 3 Autres BLESSES 1 ☐ H. 2 ☐ F. Age: ... 1 ☐ Cond. 2 ☐ Pass.	Col. V1 V2 B Col. V3 / Col. V 4 Sexe / Col. V5 V6 / Col. V7 1 TUES ou décédés dans les 3 jours. 1 ☐ H. 2 ☐ F. Age: ... 1 ☐ Cond. 2 ☐ Pass. 2 BLESSES hospitalisés plus de 6 j. 1 ☐ H. 2 ☐ F. Age: ... 1 ☐ Cond. 2 ☐ Pass. 3 Autres BLESSES 1 ☐ H. 2 ☐ F. Age: ... 1 ☐ Cond. 2 ☐ Pass.	Col. V3 / Col. V4 Sexe / Col. V5 V6 4 INDEMNE (Seul l'objet conduit ayant été heurté.) 1 ☐ H. 2 ☐ F. Age: ... 1 TUES ou décédés dans les 3 jours. 1 ☐ H. 2 ☐ F. Age: ... 2 BLESSES hospitalisés plus de 6 j. 1 ☐ H. 2 ☐ F. Age: ... 3 Autres BLESSES 1 ☐ H. 2 ☐ F. Age: ...

Si plus de 2 tués
Si plus de 3 blessés hospitalisés plus de 6 jours
Si plus de 4 blessés autres
} dans chaque véhicule ou parmi les piétons { Utiliser un autre imprimé et l'épingler en ne remplissant que les parties LIEU ET DATE et VICTIMES

Etablissement du formulaire

NOM: ..... DATE: .....

FORMULAIRE à addresser dans le plus bref delai a M. L'INGENIEUR EN CHEF des PONTS ET CHAUSSEES.

INJURED OR

B. Philippines

HIGHWAY PLANNING SURVEY

Bureau of Public Works

MOTOR VEHICLE ACCIDENT REPORT

LOCATION

Place Where Accident Occurred ..... (Barrie) ..... (Town) ..... (Province/City)

Road Accident Occurred on ..... (Give name of street, or highway name or number)

Check and complete one ..... ☐ At its intersection with ..... (Name of intersecting street, or highway name or number)

or

☐ Not at intersection .... metres North-South ..... metres East-West of .....

(Show nearest kilometre post, intersection street or highway, house number, bridge, railroad crossing, alley, driveway, culvert, or other identifying landmark).

When Accident Happened: Month ..... Date ..... Year ..... Day of Week ..... Hour ..... A.M. ..... P.M. .....

Type of Accident (Check)

☐ Pedestrians
☐ Overturned on roadway
☐ Other motor vehicle
☐ Bicycle
☐ Fixed object .....
☐ Occupant falling from vehicle
☐ Animal-drawn vehicle
☐ R.R. Train
☐ Ran off road, overturned
☐ Other .....

VEHICLES

Number of vehicles involved

Vehicle No. 1

..... (Year) (Make) (Type-Truck, Taxi, etc.)

Vehicle license plate ..... (Year) (City/Provincial) (Number)

Driver ..... (Print or type full name)

Age ..... Sex ..... License No. .....

Driver's occupation .....

Driving experience ..... years.

This vehicle was going ..... (East, East Turning North, Parked, Stopped, etc.)

on ..... (Street or Highway) Speed ..... K.P.H.

Parts of vehicle damaged .....

..... Estimated damaged P .....

Vehicle No. 2

..... (Year) (Make) (Type-Truck, Taxi, etc.)

Vehicle license plate ..... (Year) (City/Provincial) (Number)

Driver ..... (Print or type full name)

Age ..... Sex ..... License No. .....

Driver's occupation .....

Driving experience ..... years.

This vehicle was going ..... (East, East Turning North, Parked, Stopped, etc.)

on ..... (Street or Highway) Speed ..... K.P.H.

Parts of vehicle damaged .....

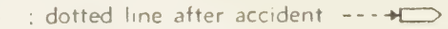
..... Estimated damaged P .....

Damage to property other than vehicles ..... (Name object, and state nature of damage) ..... Estimated cost to repair P

INJURED OR KILLED

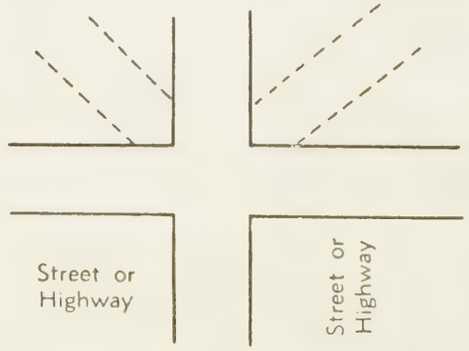
Name and Address	Age	Sex	Driver	Passenger	Vehicle Number	Killed	Injured	Nature of injury

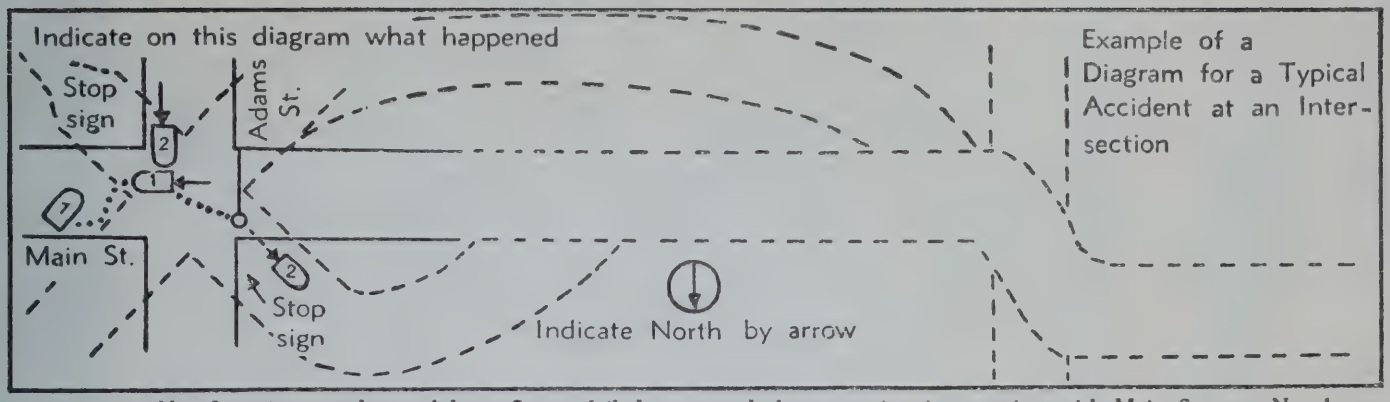
(Use one of these outlines to sketch the scene of your accident, writing in street or highway names or numbers)

1. Number each vehicle and show direction of travel by arrow:
2. Use solid line to show path before accident ; dotted line after accident 
3. Show pedestrian by:
4. Show railroad by:
5. Show distance and direction to landmarks; identify landmarks by name or number
6. Indicate north by arrow, as:

..... (Street or Highway)

Indicate on this Diagram what Happened




Indicate on this diagram what happened
Stop sign
Adams St.
Main St.
Stop sign
Indicate North by arrow
Example of a Diagram for a Typical Accident at an Intersection

No. 2, going north on Adams Street failed to stop before entering intersection with Main Street. No. 1 was going east on Main Street. No. 2 struck the right rear side of No. 1 and then went over the curb at the northwest corner after striking a pedestrian. The pedestrian was crossing Main Street form the southwest corner to the northwest corner.

INSTRUCTIONS FOR LOCATING

WHAT TO SHOW ON THE DIAGRAM:

(1) Directions from which vehicles (or vehicle) were approaching before accident; same for pedest
(2) Point of collision. Can often be determined from debris in roadway).
(3) Where vehicles (or vehicle) came to rest after collision.

WHAT TO SELECT AS LANDMARK, FROM WHICH TO MEASURE DISTANCES:

(1) A NUMBERED telephone or electric power pole nearby is most satisfactory, particularly in rur
(2) If there is no nearby numbered pole, other good landmarks in rural areas are: culvert headw
(3) In cities, measurements may be taken from the curb line of nearest cross street. Houses and b

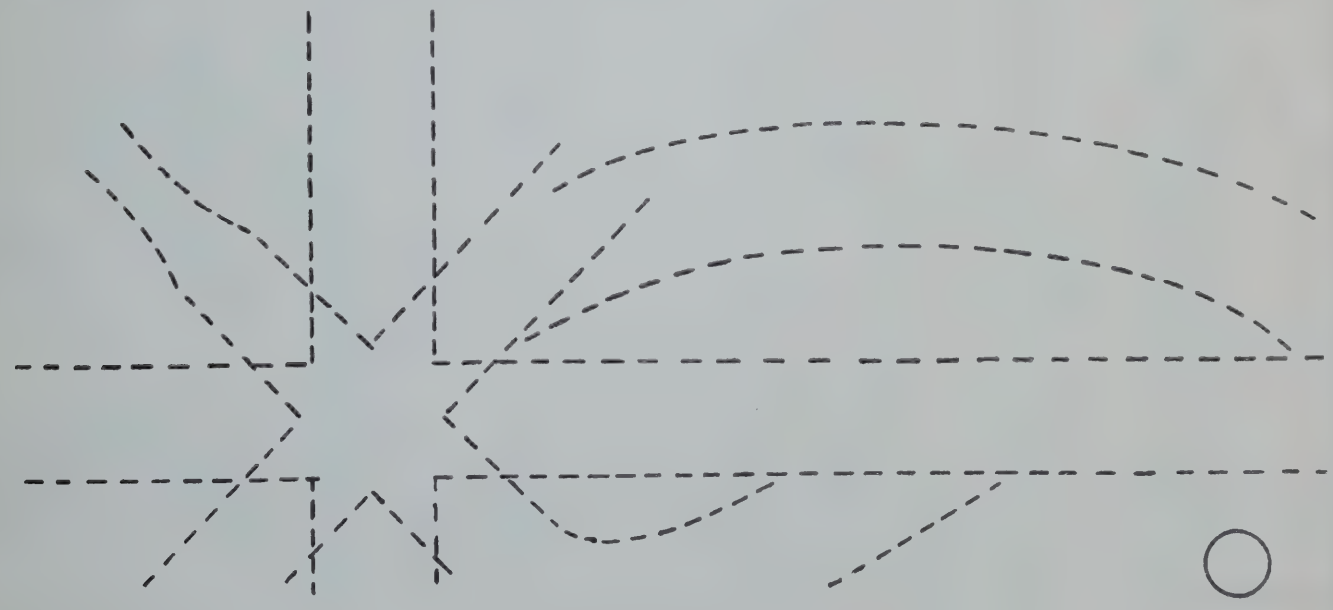
HOW TO TAKE MEASUREMENTS:

(1) Use tape-line, yardstick, or other measuring instrument, if available.
(2) If not available, measure by stepping off distance. Walk with customary stride; do not try to l man or woman.

INVESTIGATING OFFICERS ARE REQUIRED TO FILE AN OFFICIAL REPORT SEPARATELY FROM TI VIDED AT BOTTOM OF REPORT. NOTE: INVESTIGATING OFFICERS SHALL NOT SIGN A REPO

THE DRIVER OF EACH MOTOR VEHICLE INVOLVED IN AN ACCIDENT MUST MAKE A SEPARAT

INDICATE ON THIS DIAGRAM WHAT HAPPENED



ROAD

CHARACTER (Check two)
- ☐ Straight road
- ☐ Curve
- ☐ Level
- ☐ On grade
- ☐ Hillcrest

SURFACE CONDITION (Check one)
- ☐ Dry
- ☐ Wet
- ☐ Muddy
- ☐ Snowy
- ☐ Icy

SURFACE (Check one)
- ☐ Concrete
- ☐ Blacktop
- ☐ Brick
- ☐ Gravel
- ☐ Dirt
- ☐ ..... Specify other

DEFECTS (Check one or more)
- ☐ Defective shoulders
- ☐ Holes, deep ruts, bumps
- ☐ Loose material on surface
- ☐ Road under construction
- ☐ ..... Specify other
- ☐ No defects

TRAFFIC CONTROL (Check one or more)
- ☐ Officer or watchman
- ☐ Stop-and-go or flashing light
- ☐ Stop sign
- ☐ Warning sign
- ☐ Railroad crossing gates
- ☐ Railroad automatic signal
- ☐ One way street
- ☐ Traffic lanes painted or marked
- ☐ Opposing traffic lanes separated: by what .....
- ☐ ..... Specify other
- ☐ No traffic control present

KIND OF LOCALITY
Check one to show that the area adjacent to the street or highway within 300 feet was primarily:
- ☐ Manufacturing or industrial
- ☐ Shopping or business
- ☐ Residential district
- ☐ School or play ground
- ☐ Open country
- ☐ ..... Specify other

LIGHT (Check one)
- ☐ Day light
- ☐ Dusk
- ☐ Dawn
- ☐ Darkness—street lighted
- ☐ Darkness—street not lighted

WEATHER (Check one)
- ☐ Clear
- ☐ Cloudy
- ☐ Raining
- ☐ Snowing
- ☐ Fog
- ☐ ..... Specify other

VEHICLES

For other vehicles use another form

Total vehicles involved

YOUR VEHICLE—No. 1:

..... Vehicle License Plate ..... I.C.C. Plate No. ..... Was Vehicle Insured? .....
Year Make Type (sedan, truck, taxi, bus, etc) Year State Number Yes or no

Driver ..... Age ..... Sex ..... Race .....
Name Street or R.F.D. City and State White, negro etc.

Driver's Occupation ..... Driving Experience ..... Driver's License ..... ☐ Chauffeur ☐ Operator ☐ Beginner
Carpenter, sales clerk, etc. Years State Number
Speed before accident ..... Speed limit ..... Maximum safe speed .....
Miles per hour Miles per hour Miles per hour

Owner .....
Name Street or R.F.D. City and State

Parts of vehicle damaged .....
..... Approximate cost to repair vehicle $.....

OTHER VEHICLE—No. 2:

..... Vehicle License Plate ..... I.C.C. Plate No. ..... Was Vehicle Insured? .....
Year Make Type (sedan, truck, taxi, bus, etc) Year State Number Yes or no

Driver ..... Age ..... Sex ..... Race .....
Name Street or R.F.D. City and State White, negro etc.

Driver's Occupation ..... Driving Experience ..... Driver's License ..... ☐ Chauffeur ☐ Operator ☐ Beginner
Carpenter, sales clerk, etc. Years State Number
Speed before accident ..... Speed limit ..... Maximum safe speed .....
Miles per hour Miles per hour Miles per hour

Owner .....
Name Street or R.F.D. City and State

Parts of vehicle damaged .....
..... Approximate cost to repair vehicle $.....

DAMAGE TO PROPERTY OTHER THAN VEHICLES .....
Name object, show ownership, and state nature of damage
..... Approximate cost to repair $ .....

INJURED

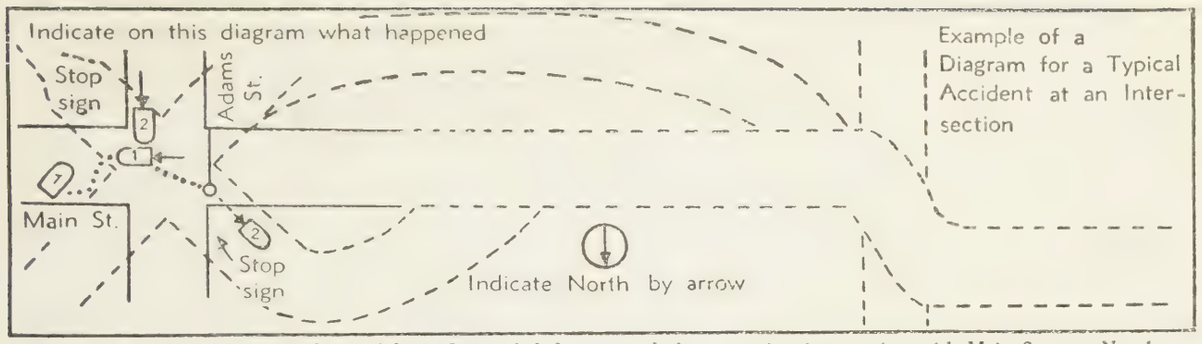
Total injured

Name ..... Address ..... ☐ Driver ☐ Passenger ☐ Pedestrian In vehicle No. .....
Age ..... Sex ..... Race ..... Nature and extent of injuries .....
..... Was person killed? .....
☐ ..... Specify other

Name ..... Address ..... ☐ Driver ☐ Passenger ☐ Pedestrian In vehicle No. .....
Age ..... Sex ..... Race ..... Nature and extent of injuries .....
..... Was person killed? .....
☐ ..... Specify other

S R 300 — Revised 10-1-55

IMPORTANT! If you had an automobile liability policy at the time of the accident, secure from your agent or insurance company a notice of insurance (Form SR-21) and send it with this report to the Division of Motor Vehicles or have your agent send it at once.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Example of a Diagram for a Typical Accident at an Intersection
Stop sign
Adams St.
Main St.
Stop sign
Indicate North by arrow

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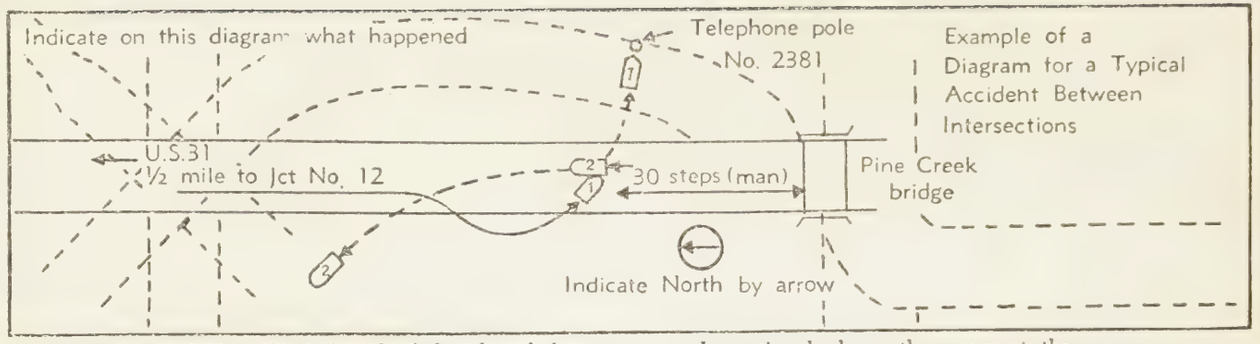

Indicate on this diagram what happened
Telephone pole No. 2381
Example of a Diagram for a Typical Accident Between Intersections
U.S.31
½ mile to Jct No. 12
30 steps (man)
Pine Creek bridge
Indicate North by arrow

Tne right front wheel of No. 1 slipped off the edge of the pavement. In getting back on the pavement the driver turned too sharply and allowed his car to go to the wrong side of the road where it struck the left rear side of No. 2. Both vehicles left the roadway after the collision and No. 1 then struck a telephone pole.

INSTRUCTIONS FOR LOCATING ACCIDENT AND MAKING DIAGRAM

WHAT TO SHOW ON THE DIAGRAM:

(1) Directions from which vehicles (or vehicle) were approaching before accident; same for pedestrian.
(2) Point of collision. Can often be determined from debris in roadway).
(3) Where vehicles (or vehicle) came to rest after collision.

WHAT TO SELECT AS LANDMARK, FROM WHICH TO MEASURE DISTANCES:

(1) A NUMBERED telephone or electric power pole nearby is most satisfactory, particularly in rural areas. BUT DO NOT USE AN UNNUMBERED POLE.
(2) If there is no nearby numbered pole, other good landmarks in rural areas are: culvert headwall (number to be recorded, if any); house, barn, railway crossing.
(3) In cities, measurements may be taken from the curb line of nearest cross street. Houses and business places in cities can always be identified by street number.

HOW TO TAKE MEASUREMENTS:

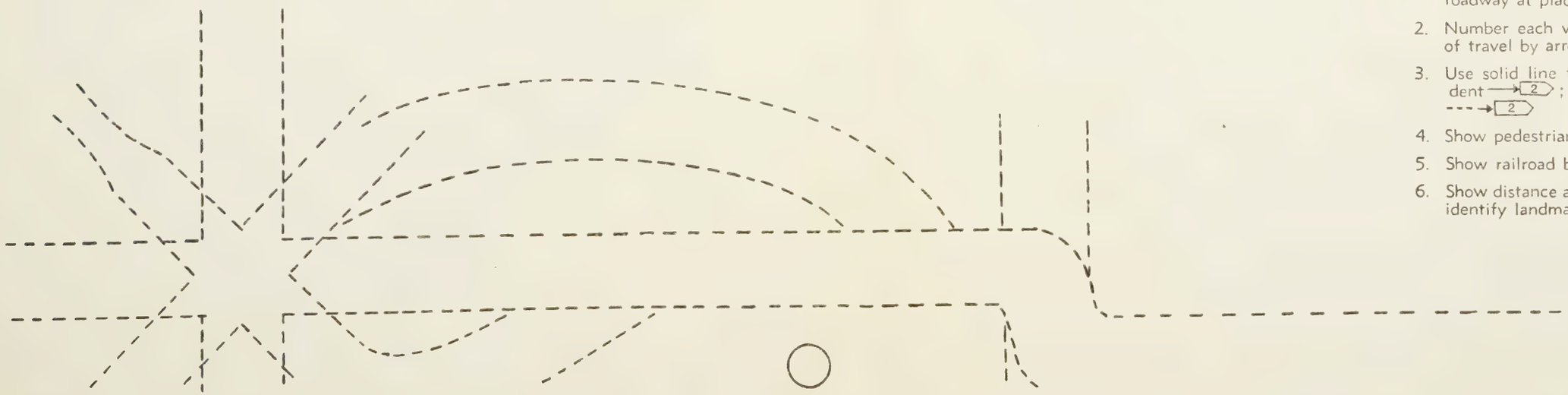
(1) Use tape-line, yardstick, or other measuring instrument, if available.
(2) If not available, measure by stepping off distance. Walk with customary stride; do not try to lengthen steps. Report the number of steps, as taken along the roadway, and state whether steps were taken by man or woman.

INVESTIGATING OFFICERS ARE REQUIRED TO FILE AN OFFICIAL REPORT SEPARATELY FROM THE REPORT OF EACH DRIVER INVOLVED. OFFICERS SHALL SIGN THEIR REPORTS IN THE SPACE PROVIDED AT BOTTOM OF REPORT. NOTE: INVESTIGATING OFFICERS SHALL NOT SIGN A REPORT MADE BY A DRIVER.

THE DRIVER OF EACH MOTOR VEHICLE INVOLVED IN AN ACCIDENT MUST MAKE A SEPARATE REPORT EVEN THOUGH A REPORT IS MADE BY AN ENFORCEMENT OFFICER.

(Tear off before mailing report)

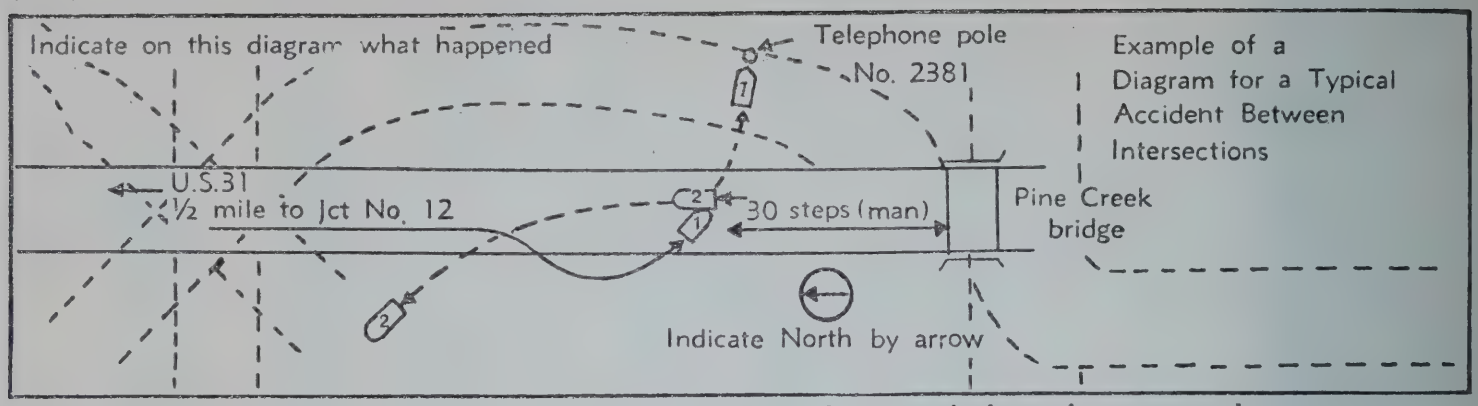
INDICATE ON THIS DIAGRAM WHAT HAPPENED



INSTRUCTIONS:

1. Follow dotted lines to draw outline of roadway at place of accident.
2. Number each vehicle and show direction of travel by arrow: → 1 2 ←
3. Use solid line to show path before accident → 2 ; dotted line after accident - - - → 2
4. Show pedestrian by: ——o
5. Show railroad by: ++++++++++++
6. Show distance and direction to landmarks; identify landmarks by name or number.

(cont'd)



Tne right front wheel of No. 1 slipped off the edge of the pavement. In getting back on the pavement the driver turned too sharply and allowed his car to go to the wrong side of the road where it struck the left rear side of No. 2. Both vehicles left the roadway after the collision and No. 1 then struck a telephone pole.

CCIDENT AND MAKING DIAGRAM

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5. Show railroad by: ⊣⊢⊣⊢⊣⊢⊣⊢
6. Show distance and direction to landmarks; identify landmarks by name or number.

WHAT DRIVERS WERE DOING
(Check one for each driver)

Driver 1 2

- ☐ ☐ Going straight ahead
- ☐ ☐ Making right turn
- ☐ ☐ Making left turn
- ☐ ☐ Making U turn
- ☐ ☐ Slowing or stopping
- ☐ ☐ Starting in traffic lane
- ☐ ☐ Starting from parked position
- ☐ ☐ Stopped in traffic lane
- ☐ ☐ Parked
- ☐ ☐ Backing

(Check applicable items)

- ☐ ☐ Passing
- ☐ ☐ Avoiding vehicle, object or pedestrian
- ☐ ☐ Skidded before applying brakes
- ☐ ☐ Skidded after applying brakes
- ☐ ☐ Hit and run
- ☐ ☐ Driverless moving vehicle

DRIVERS' VIOLATIONS INDICATED (Check one or more for each driver)

Driver 1 2

- ☐ ☐ Exceeded lawful speed
- ☐ ☐ Did not grant right of way to vehicle
- ☐ ☐ Did not grant right of way to pedestrian
- ☐ ☐ Followed too closely
- ☐ ☐ Drove through safety zone
- ☐ ☐ Passed on hill
- ☐ ☐ Passed on curve
- ☐ ☐ Cut in after passing
- ☐ ☐ Other improper passing
- ☐ ☐ On wrong side of road not in passing
- ☐ ☐ Failed to give signal or gave improper signal
- ☐ ☐ Improper turn — wide right turn
- ☐ ☐ Improper turn — cut corner on left turn
- ☐ ☐ Improper turn — from wrong lane
- ☐ ☐ Other improper turning

Driver 1 2

- ☐ ☐ Disregarded police officer
- ☐ ☐ Disregarded stop-and-go light
- ☐ ☐ Disregarded flashing light
- ☐ ☐ Disregarded stop sign
- ☐ ☐ Disregarded warning sign
- ☐ ☐ Improper starting from parked position
- ☐ ☐ Improper parking location
- ☐ ☐ Other improper actions:
- ☐ ☐ .....
- ☐ ☐ .....
- ☐ ☐ .....
- ☐ ☐ .....
- ☐ ☐ No improper driving

WHAT PEDESTRIAN WAS DOING
(Check one)

- ☐ Crossing at intersection — with signal
- ☐ Crossing at intersection — against signal
- ☐ Crossing at intersection — no signal
- ☐ Crossing at intersection — diagonally
- ☐ Crossing not at intersection
- ☐ Coming from behind parked cars
- ☐ Walking in roadway — (Check two below)
  - ☐ With traffic
  - ☐ Against traffic
  - ☐ Sidewalks available
  - ☐ Sidewalks not available
- ☐ Pushing or working on vehicle
- ☐ Other working on roadway
- ☐ Playing on roadway
- ☐ Hitching on vehicle
- ☐ Not on roadway (Explain): .....
- ☐ .....

Specify other action

Occupation .....

CONDITION OF DRIVERS AND PEDESTRIAN:

Driver: (Check one or more) 1 2 Ped.

- ☐ ☐ ☐ Sick
- ☐ ☐ ☐ Fatigued
- ☐ ☐ ☐ Apparently asleep
- ☐ ☐ ☐ Body defect (arms, eyesight, paralysis, etc.)
- ☐ ☐ ☐ No apparent defects
- ☐ ☐ ☐ Defects not known

Driver: (Check only one) 1 2 Ped.

- ☐ ☐ ☐ *Had not been* drinking

Had been drinking. If so:

- ☐ ☐ ☐ Obviously drunk
- ☐ ☐ ☐ Ability impaired
- ☐ ☐ ☐ Ability not impaired
- ☐ ☐ ☐ *Not known* if impaired
- ☐ ☐ ☐ Not known if drinking

Explain condition .....

.....

VEHICLE CONDITION
(Check one or more)

Driver 1 2

- ☐ ☐ Defective brakes
- ☐ ☐ Improper lights
- ☐ ☐ Defective steering mechanism
- ☐ ☐ Defective tires
- ☐ ☐ Other defects
- ☐ ☐ No defects
- ☐ ☐ Defects not known
- ☐ ☐ Chains in use

DRIVER VISION OBSCURED
(Check one or more in each section)

Driver 1 2

- ☐ ☐ Rain, snow, etc. on windshield
- ☐ ☐ Windshield otherwise obscured
- ☐ ☐ Vision obscured by load on vehicle
- ☐ ☐ .....

Specify other

- ☐ ☐ Vision not obscured

Driver 1 2

- ☐ ☐ Trees, crops, etc.
- ☐ ☐ Building
- ☐ ☐ Embankment
- ☐ ☐ Sighboard
- ☐ ☐ Hillcrest
- ☐ ☐ Parked vehicles
- ☐ ☐ Moving vehicles

Specify other

- ☐ ☐ .....
- ☐ ☐ Not obscured

DESCRIBE WHAT HAPPENED:
(Refer to vehicles by number)

Use this space for listing additional injured persons. Also explain questions not fully answered by checking in the boxes provided. If more space is needed use another form or a sheet of paper the same size.

.....

SIGNATURE .....

Signature of person submitting report is required — Address — Date of report

- ☐ Witness
- ☐ Occupant
- ☐ Driver

INVESTIGATOR'S SIGNATURE .....

Investigator's rank and name — Badge No. — Department — Date of report

Annex V

Table forms for preparation of annual accident statistics

TABLE 1. NUMBER OF ACCIDENTS

YEAR ....

Accidents involving personal injury				
Fatal	*Non-fatal*	*Total (1) + (2)*	*Accidents involving property damage only*	*Total (3) + (4)*
(1)	*(2)*	*(3)*	*(4)*	*(5)*

DEFINITIONS

Accident: For the purposes of international statistics of road accidents, an accident shall mean any accident to a road user on a road open to public traffic which causes death, injury or material damage provided that a vehicle (including bicycles with or without engine) or an animal, whether in motion or not, is involved.

Fatal injury: A person shall be considered as being fatally injured (killed) if his death is a result of the accident and occurs within thirty days.

Serious injuries: Fractures, concussion, internal lesions, crushing, severe cuts and laceration, severe general shock requiring medical treatment and any other lesions entailing detention in hospital.

TABLE 2. NUMBER OF PERSONS KILLED OR INJURED

Classification	*Number of persons*				
		Injured			
	Killed (1)	*Seriously (2)*	*Slightly (3)*	*Total (2) + (3) (4)*	*Grand total (1) + (4) (5)*
Pedestrians					
Drivers and passengers of bicycles or tricycles without auxiliary engine					
Drivers and passengers of motor cycles or motor bicycles					
Drivers and passengers of mechanically propelled road vehicles, other than cycles and motor cycles					
Drivers and passengers of animal - drawn vehicles					
Riders or drivers of horses or other animals					
Other persons					
TOTAL					

Slight injuries: Secondary injuries such as sprains or bruises. Persons complaining of shock, but who have not sustained other injuries, should not be included in the statistics unless they show very clear symptoms of shock, have received medical treatment or appeared to require medical attention.

Fatal accident: An accident involving one or more fatal injuries (such accidents may also involve non-fatal injuries).

Non-fatal accident: An accident involving one or more injuries (serious or slight), none of the injuries being of a fatal character.

Private cars: Motor passenger vehicles with a maximum number of nine seats, including the driver's.

TABLE 3. ANALYSIS OF VEHICLES INVOLVED IN ACCIDENTS

Classification of vehicles	*Number of vehicles involved*			
		Non-fatal accidents		
	Fatal accidents (1)	*Personal injuries (2)*	*Property damage only (3)*	*Total (1) + (2) + (3) (4)*
Mechanically propelled road vehicles:				
Motor cycles, including motor bicycles and motor tricycles				
Private cars, including taxis				
Goods motor vehicle not exceeding 3,500 kilogrammes, maximum permissible weight:				
Without trailer ..				
With trailer				
Goods motor vehicles exceeding 3,500 kilogrammes, maximum permissible weight:				
Without trailer ..				
With trailer				
Motor coaches, omnibuses and trolley buses ...				
Tramcars				
Other mechanically propelled vehicles				
TOTAL				
Other vehicles:				
Bicycles and tricycles without auxiliary engine				
Railway vehicles				
Animal - drawn and miscellaneous non-mechanically propelled vehicles				
Horses ridden or led, and other animals ..				

TABLE 4. NATURE OF ACCIDENTS

Nature of accidents	Number of accidents		Persons		
	Personal fatal or non-fatal injuries (1)	Property damage only (2)	Killed (3)	Injured (4)	Total (3) + (4) (5)
Collision between moving vehicles, including vehicles temporarily stopped in traffic					
Collision between moving vehicle and obstruction including stationary vehicles					
Collision between moving vehicle and pedestrian					
Collision between moving vehicle and animals ..					
Other kinds of accident					
TOTAL					

TABLE 5. ACCIDENTS CLASSIFIED BY MONTH
(Accidents resulting in death or personal injuries)

Month	Total number of accidents	Number of holidays in each month (excluding Sundays)
January		
February		
March		
—		
—		
December		
TOTAL		

TABLE 6. ACCIDENTS CLASSIFIED BY DAYS OF THE WEEK
(Accidents resulting in death or personal injuries)

Days of the week	Total number of accidents
Monday	
Tuesday	
Wednesday	
—	
—	
Sunday	
TOTAL	

TABLE 7. ACCIDENTS CLASSIFIED BY HOURS OF THE DAY
(Accidents resulting in death or personal injuries)

Hours	Total number of accidents
0 — 1	
—	
—	
—	
23 — 24	
TOTAL	

TABLE 8. PERSONS KILLED OR INJURED, CLASSIFIED BY AGE GROUPS
(Pedestrian and vehicle drivers)

Age	Pedestrian			Drivers killed or injuried								Drivers involved (whether or not they are victims)
				Drivers of bicycles and tricycles without engine		Drivers of motor cycles, including motor bicycles and motor tricycles		Drivers of other mechanically propelled vehicles		Drivers of other non-mechanically propelled road vehicles		
	Killed	Injured	Others	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year												
0- 4												
5-14												
15-24												
25-34												
35-44												
45-54												
55-64												
65 and above												
Year												
0- 4												
5-14												
15-24												
25-64												
65 and above												
TOTAL												

ANNEX V (cont'd)

TABLE 9. ACCIDENTS CLASSIFIED ACCORDING TO SURROUNDINGS [a]

Road conditions and surroundings	Nature of Accident: Fatal: Collision between moving vehicles [b]	Fatal: Collision between moving vehicle and obstruction [c]	Fatal: Collision between moving vehicle and animals	Fatal: Collision between moving vehicle and pedestrian	Fatal: Other kinds of accident	Non-fatal: Collision between moving vehicles [b]	Non-fatal: Collision between moving vehicle and obstruction [c]	Non-fatal: Collision between moving vehicle and animals	Non-fatal: Collision between moving vehicle and pedestrian	Non-fatal: Other kinds of accident	Property damaged only: Collision between moving vehicles [b]	Property damaged only: Collision between moving vehicle and obstruction [c]	Property damaged only: Collision between moving vehicle and animals	Property damaged only: Collision between moving vehicle and pedestrian	Property damaged only: Other kinds of accident	Total
A. *Characteristics of surroundings:*																
Built-up area																
Area not built-up ..																
TOTAL																
B. *Site and layout:*																
Intersection, including rotary intersection																
Hill top or crest ..																
Curve																
Other situation																
TOTAL																
C. *Type of highway:*																
Undivided two-way highway without cycle track																
Undivided two-way highway with cycle track																
Dual highway without cycle track ..																
Dual highway with cycle track																
One-way road																
TOTAL																

[a] Depending on condition of roads and nature of accidents
[b] Including vehicles temporarily stopped in traffic.
[c] Including stationary vehicles.

TABLE 10. CLASSIFICATION OF ACCIDENT FACTORS

A. Faults committed by Road Users

Type of fault	Accidents: Fatal	Accidents: Non-fatal
A. *Fault of drivers of mechanically propelled road vehicles:*		
Exceeding reasonable speed in view of circumstances (road traffic density, weather conditions, etc.)		
Exceeding lawful speed		
Failing to give right of way to other vehicles		
Failing to give signal or giving improper signal		
Encroaching on lane or roadway reserved for other road users		
Passing on hill		
Passing on curve		
Other improper passing		
Skidding		
Stationary vehicles dangerously placed on road		
Disregarding police officer		
Disregarding traffic signal		
Disregarding STOP sign		
Disregarding other signs		
Sick or apparently asleep		
Driving ability impaired by drunkenness		
Driving ability impaired by body defects		
Other faults		
B. *Fault of drivers of bicycles or tricycles without auxiliary engine:* (Same as A above)		
C. *Fault of pedestrian:*		
Passing or walking on roadway regardless of traffic		
Drunk		
Coming from behind parked cars		
Other faults		

B. Other Contributory Factors

Contributory factor	Accidents: Fatal	Accidents: Non-fatal
A. *Vehicles or vehicle load:*		
Defects or mechanical deficiency of vehicles		
Insufficient or defective head or rear lights or reflectors		
Overloading of vehicles or displacing of load		
Other contributory conditions of vehicles		
B. *Road conditions:*		
Restricted visibility at curve or intersection		
Slippery road		
Bad surface		
Snow or ice on road		
Obstacles on roadway		
C. *Weather conditions:*		
Fog or mist		
Other conditions		
D. *Miscellaneous factors:*		
Animals on roadway		
Other factors		

Annex VI

Draft Agreement and Specifications for Uniform Road Markings

A. *DRAFT AGREEMENT*

Article 1

(a) For the purpose of this Agreement, road markings are markings indicated by lines, studs, or in any other manner, on the surface of the travelled way or on its ancillary works, such as kerbs, foot-paths and shoulders, for the control, warning, guidance or information of road users.

(b) Road markings on the surface of the travelled way are called "surface markings" and shall be classified as follows:

(i) longitudinal markings;

(ii) transverse markings;

(iii) other markings.

Types of marking at present included in each category are given in section B of this annex.

Article 2

(a) Longitudinal markings shall consist of continuous lines or broken lines.

(b) When a longitudinal marking consists of a continuous line, it restricts traffic to the extent that no vehicle should cross or straddle such a line. Conditions for its use are given in section B of this annex.

(c) When a longitudinal marking consists of a broken line, vehicles are allowed to cross it, provided that this can be done with safety. These markings serve as a guide to drivers and to facilitate the movement of traffic in lanes. Conditions for their use are given in section B of this annex.

(d) A continuous line may be used adjacent to a broken line. If so used, in countries where traffic moves to the right (left) a vehicle should not cross the continuous line adjacent to and to the right (left) of a broken line on the left (right) of the lane in which it is moving. A vehicle may, however, cross the continuous line if that line, at the left (right) of the lane in which the vehicle is moving is to the left (right) of, and adjacent to, a broken line.

Article 3

(a) Transverse markings shall consist of a continuous or a broken line. Types of such markings are given in section B of this annex.

(b) Where a continuous line is used across one or more of the approach lanes of an intersection, it indicates the line behind which drivers should stop when complying with a STOP or HALT sign, an indication given by a traffic signal or a police officer, or any other traffic regulation.

Article 4

(a) Other markings, such as arrows painted on the travelled way, oblique parallel lines or works painted on the travelled way, may be used to supplement other signs or to give appropriate indications or guidance to road users.
(b) Recommended types of such markings are given in section B of this annex.

Article 5

Markings on ancillary works of the roadway, notably kerbs and shoulders, may be used to improve the visibility, especially at night, of the kerbs or of obstacles in the roadway. They may also be utilized to indicate areas where waiting is forbidden, bus-stops, or to give other similar indications.

Article 6

(a) Each Contracting Party shall keep the same colour or combination of colours for all road markings having the same meaning.

(b) Road surface markings shall be yellow and/or white, the latter including shades of silver and light grey. When both colours are used, one colour must be reserved for markings other than border lines, intended to control or guide moving vehicular traffic, and the other colour must be reserved for pedestrian and cycle crossings, border lines and markings indicating existing parking or waiting regulations.

Article 7

Each Contracting Party shall establish standards (visibility, slipperiness, maximum height above the surface), to which the materials used for roadway markings shell conform.

Article 8

The Contracting Parties shall endeavour to apply, at the time of the placing or the renewal of the road markings on their roadways, the recommendations contained in section B of this annex.

B. *DETAILED SPECIFICATIONS FOR UNIFORM ROAD MARKINGS*

1. *Function*

Road surface markings are generally used to show the limits of the travelled way and the parts of the travelled way reserved for the different directions of traffic or for certain types of road users, or to indicate to the motorist where and how he should drive. They are sometimes used with other traffic control devices in order to reinforce or make more specific the indication given by such devices.

2. *Type of road markings*

The types included in the three categories of road markings consist of:

(a) Longitudinal markings, indicating: centre lines, border lines, lane lines, restricted overtaking, change in width of the travelled way, or approach to obstacles.

(b) Transverse markings, indicating: Stop lines, pedestrian crossing or cyclist crossings.

(c) Other markings (arrows, oblique parallel lines, words, etc.), used to give further indications to road users.

3. *General recommendations*

Road markings may be either painted or indicated by some equally or more effective means. Materials used for this purpose should not be slippery. Any material adopted for use should be given a reasonably long trial on the road before final adoption.

Studs or other similar devices at present in use are not generally suitable for marking continuous lines. When used for broken lines or to supplement other road markings, they should not, in relation to the level of the roadway, project more than 1.5 centimetres or more than 2.5 centimetres in the case of studs incorporating retro-reflectors.

4. *Reflectors*

The use of reflector material or reflector devices for road markings serves to render them more visible by night on unlighted roads. Their use is therefore recommended on such roads.

5. *Detailed specifications*

(a) *Longitudinal markings*

(i) *Dimensions*

The width of lines for longitudinal markings, whether continuous or broken lines, should be at least 10 centimetres (4 inches) and should not normally exceed 15 centimetres (6 inches).

When a continuous line is used alongside a broken line or another continuous line, the distance between the lines should not be greater than 15 centimetres nor less than 10 centimetres.

The broken lines consist of alternate stripes and gaps, each of uniform length. The speed of vehicles on the section of road or in the area concerned should be taken into account when choosing these lengths.

In normal traffic conditions in rural areas, the broken line should be divided into stripes of between 2 and 10 metres (6.5 to 32 feet).

The distance between two successive stripes should not be less than the length of one stripe nor more than 10 metres.

Where traffic is slow, the size and spacing of the stripes should be less than those in open country. They may be as little as 1 metre (40 inches) long but the gap should then not exceed 5 metres (16 feet).

On main urban arteries with fast-moving traffic, however, the features or longitudinal markings should be the same as in rural areas.

(ii) *Marking traffic lanes*

If traffic lanes on either a two-way or a one-way road are to be indicated, this should be done by means of broken lines.

Open country

It is recommended that, on two-way roads with two lanes, the centre of the roadway should be indicated by a longitudinal marking when the traffic volume is large or when fog is prevalent or in special cases. The road marking for this situation is normally a broken line. Only in special circumstances and under the conditions specified below, should continuous lines be used.

The lanes of three-lane roads, on sections of normal visibility, should be indicated by broken lines.

Marking of lanes on a multiple-lane roadway is recommended.

Built-up areas

Marking of traffic lanes is recommended on roads carrying at least two lines of traffic in each direction, and on one-way streets carrying at least two lines of traffic.

At the approaches to major intersections (especially controlled intersections) where sufficient width is available for two or more lines of vehicles, it is recommended that traffic lanes should be marked as shown in figure 17. In such cases, the lane lines may be supplemented by arrow markings (see section C below).

It may also be desirable to mark traffic lanes at points where the width of roadway is reduced by kerbs or islands.

(iii) *Markings at particular locations: use of continuous lines*

In order to improve the flow of traffic, it may be advisable at some intersections to replace the broken centre lines by a continuous line, or supplement them in this manner (as shown in figures 14, 15 and 16).

Measures restricting overtaking are desirable on two-way roads at places where sight distance is restricted (hump-backed bridge, a bend in the road, etc.) or where the travelled way becomes narrow, or because of some other peculiarity.

These restrictions should be imposed on sections where the sight distance is less than a certain minimum (M), by means of a continuous line used in accordance with the figures indicated below[a]. The value to be adopted for M varies with road conditions. Figures 2 and 3 show, for a two-lane and three-lane road respectively, the design of the lines at a summit with restricted sight distance. These figures correspond to the profile shown in figure 1, where M represents the length defined above. A (or D) is the point where the sight distance becomes less than M, while C (or B) is where sight distance is again more than M[b].

Where the sections AB and CD overlap (figure 4), that is, when forward visibility in both directions occurs before reaching the top of the summit, the lines are arranged in the same way, but the continuous barrier lines alongside the broken centre line do not overlap. This is shown in figure 5 and 6.

Figure 7 shows the design of the lines, on the same hypothesis, on a curve with restricted sight distance on a two-lane road. On three-lane roads two methods are possible. These are shown in figures 3 and 3a. Figure 3 should be used where there is a substantial proportion of two-wheeled vehicles and figure 3a when traffic is mainly four-wheeled.

In figures 3, 3a, 6 and 6a, the angle of the oblique transition lines in relation to the centre line of the road must be less than 1:10, and preferably 1:20. In figures 8,9,10 and 10a, which illustrate the methods to be used to indicate the changes in the width of the roadway, this angle should be between 1:20 and 1:40. In addition, the oblique continuous line should be preceded, in the direction to which it applies, by a continuous line parallel to the centre of the roadway, the length of which corresponds to the distance travelled in one second at the operating speed adopted.

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[a] The definition of sight distance used in the draft agreement is the distance at which an object placed on the roadway at 1.2 metres (4 feet) above the roadway can be seen by an observer on the road, whose eye is also 1.2 metres above the roadway.

[b] On narrow roads with little traffic, where the layout shown in figures 2 and 3 might reduce the width of the traffic lanes; figure 2 could be changed between A and D by a single continuous centre line, without a broken centre line alongside, preceded by a broken centre line divided into at least three parts. This would certainly be less expensive and last longer than method 1. Nevertheless this simplified plan should be used with care and only in exceptional cases, since it prevents the driver from overtaking over a certain distance even though there is adequate sight distance. Wherever possible, it is essential to avoid using both methods on the same route or in the same region, as this may lead to confusion.

When it is unnecessary to mark the lanes by broken lines on a normal section of road, the broken centre line should precede the continuous lines which accompany it, over a distance of at least 50 metres (165 feet), and preferably 75 metres (247 feet).

(iv) *Use of double continuous line*

On wide roads, a single continuous line may be replaced by a double continuous line, in order to improve its visibility.

(v) *Conditions for use of continuous (barrier) lines*

The distance and circumstances which allow the driver of a vehicle safely to overtake the vehicle in front depends on several factors, but mainly on the relative speed of the two vehicles, the speed at which oncoming vehicles are approaching and the volume of traffic.

If the longest overtaking distance is used as a basis for marking barrier lines (that is, corresponding to overtaking in the most unfavourable circumstances), the lines which are then marked are a guarantee of safety, provided all drivers observe them. However, they greatly restrict the use of the travelled way, for the most unfavourable circumstances do not occur frequently. Indeed, lines determined on this basis might well prove more harmful than useful, if they encourage impatient drivers to cross a barrier line whatever the situation. If, on the other hand, there is no barrier line on a section where visibility is not sufficient for overtaking, the driver is free to decide for himself whether he can or cannot overtake safely, a decision he may not always be able or willing to make.

For these reasons the choice of sight distance to be used in determining the desirability or otherwise of marking a continuous barrier line, and also in determining the desired length of the line, of necessity involves a compromise. The following figures show the recommended range of values of M for various speeds of approach:[c]

Approach speed (per hour)		*Range of values for M*			
		Minimum		*Maximum*	
Kilometres	*Miles*	*Metres*	*Feet*	*Metres*	*Feet*
100	60	250	800	450	1.500
80	50	160	530	300	1,000
65	40	110	365	180	600
50	30	60	200	150	500

(vi) *Border lines marking the edge of the travelled way*

Border lines marking the edge of the travelled way are especially useful when there are no raised kerbs. The marking may be a broken line or a different pattern from that used for lane markings, or a continuous line of a different width or colour from that used for barrier lines. Studs, buttons or reflectors may be used in conjunction with the lines, or as an alternative.

(vii) *Marking obstacles*

Figures 11, 12 and 13 show the lines to be used near an island or some other obstacle on the travelled way.

(viii) *Guide lines for turning vehicles*

At some intersections it is desirable to show drivers how to turn left (right). Figure 19 is a suggestion for these guides, which should be broken lines; they may be supplemented by arrows. Because of the great variety of layouts at intersections, it is very difficult to standardize such markings.

(b) *Transverse markings*

(i) *General*

Owing to the angle at which a driver sees markings on a road surface, transverse markings have to be wider than longitudinal ones if the same visibility is to be obtained.

(ii) *Stop lines*

The minimum width of a stop line should be 20 centimetres (8 inches) and the maximum 50 centimetres (20 inches). A width of 30 centimetres (12 inches) is recommended.

When used with a STOP sign, the stop line should be placed in such a position that a driver who stops immediately behind the line has the best possible view of traffic on the other arms of the intersection, consistent with the requirements of other vehicular and pedestrian traffic. The indication given by the STOP sign and the line may be supplemented by marking the work STOP or HALT on the travelled way (see section C, below).

Stop lines may be supplemented by continuous longitudinal lines marking the traffic lanes (see figure 20).

(iii) *Pedestrian crossings*

Zebra markings are visible from a greater distance than other forms of road marking and are therefore especially useful for delineating the position of pedestrian crossings. The space between the stripes should be equal to the width of the stripes and should be between 50 and 60 centimetres (20 to 24 inches). The stripes should be parallel to the direction of traffic. The minimum width which is recommended for a pedestrian crossing is 2.5 metres (8 feet).

Pedestrian crossings may also be indicated by studs, buttons or broken lines. Studs and buttons are not recommended, however. Broken lines marking pedestrian crossings should consist

[c] The approach speed which should be used in this calculation is the speed below which 85 per cent of the vehicles travel, or the design speed if it is higher.

of stripes of 50 centimetres (20 inches) long and at least 15 centimetres (6 inches) wide. The gaps should be 20 centimetres (8 inches) long. The space between two broken lines should be at least 2.5 metres (8 feet) wide. When studs or buttons are used to mark pedestrian crossings, they should be between 40 and 60 centimetres (16 to 24 inches) apart.

(iv) *Cyclist crossings*

Zebra markings are also recommended for cyclist crossings, but these should be distinguished from pedestrian crossings by stripes of a different width from those for pedestrian crossings.

Cyclist crossings may also be indicated by studs, buttons or broken lines of a different pattern from those used for pedestrian crossings. Studs and buttons are not recommended, however. The width of the crossings should be not less than 2.5 metres (8 feet).

(c) *Other markings*

(i) *Arrow markings*

On roads where sufficient traffic lanes are available to segregate traffic approaching an intersection, the lanes which traffic should use may be indicated by arrow markings applied on the road surface (see figures 17 and 18). They may also be used on a one-way road to confirm the direction of travel.

Arrow markings should not be longer than 5 metres (16 feet). They may be supplemented by word markings.

(ii) *Oblique parallel markings (see figure 21)*

Such markings may be used to delineate areas of the road surface, or areas raised slightly above the road surface, which vehicles should not enter. They are especially useful at the approaches to obstacles in the travelled way, such as islands.

(iii) *Word markings*

Word markings on the road surface may be used for the purpose of guiding, warning or regulating traffic. The words used should preferably be place names, route numbers or words which are easily understood internationally such as "stop", "bus" and "taxi". The letters should be greatly elongated in the direction of traffic movement because of the low angle at which they are viewed by approaching drivers. A method of achieving this is illustrated in figure 22.

Where traffic speeds are greater than 50 kilometres per hour (30 miles per hour), lettering should be at least 2.5 metres (8 feet) in height.

(iv) *Parking space limits*

Parking space limits may be indicated on the road surface by appropriate lines (see figure 23).

(v) *Markings indicating parking restrictions*

Kerb or road surface markings may be used to show where parking is prohibited. The marking should be a continuous line covering the top of the kerb or on the road surface close to it. If desired, the face of the kerb may be similarly marked.

(vi) *Kerb markings to improve visibility*

Kerb markings as shown in figure 24 may be used where necessary to enhance the visibility of a kerb (especially at night).

(vii) *Bus stops*

The continuous line on the kerb used to denote "parking prohibited" may also be used to advantage to indicate the length of kerb which should be reserved for buses. This marking may be supplemented if desired by word markings on the road surface, or by an area of distinctive road surface.

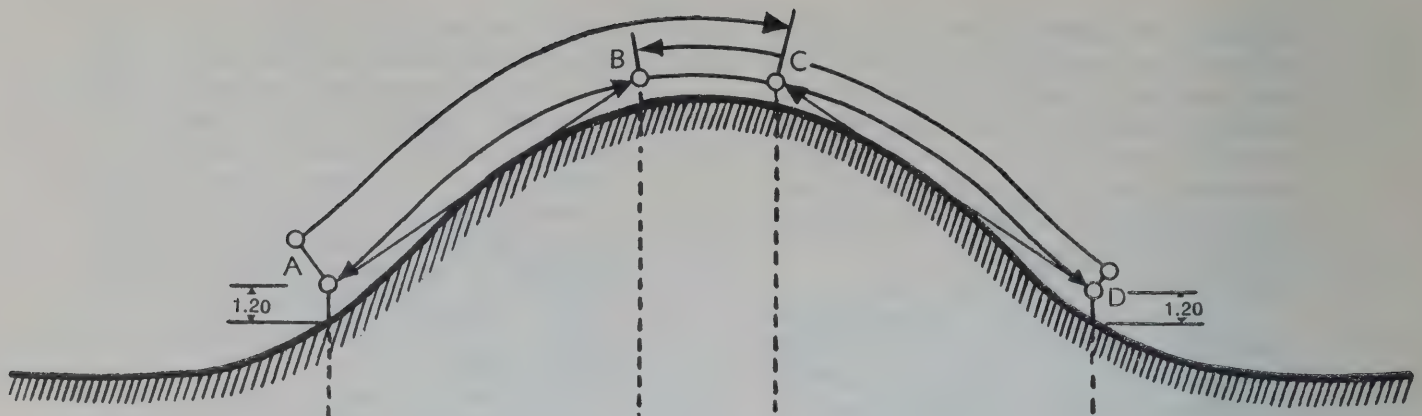

Fig. 1. Profile of sight distance

Fig. 2.

Fig. 2a.

Fig. 2, 2a Design of traffic lines for a two-lane road

Fig. 3.

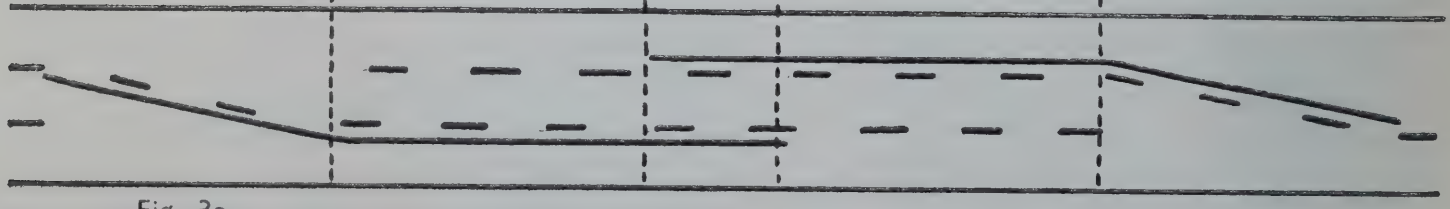

Fig. 3a.

Fig. 3, 3a Design of traffic lines for a three-lane road

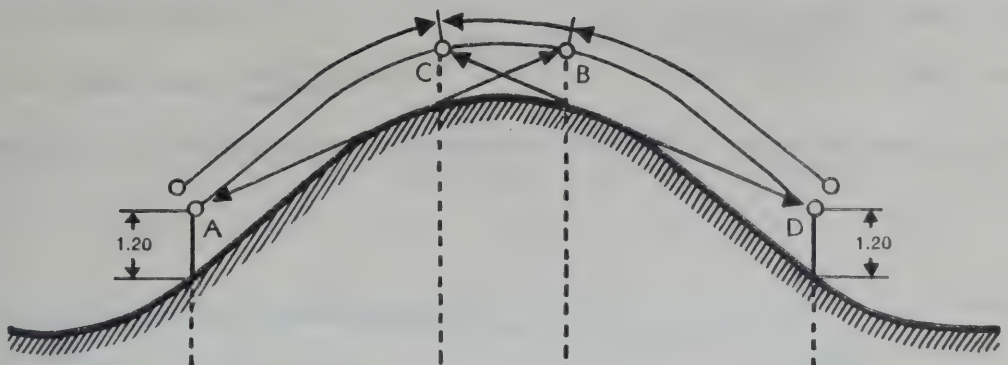

Fig. 4

Fig. 5

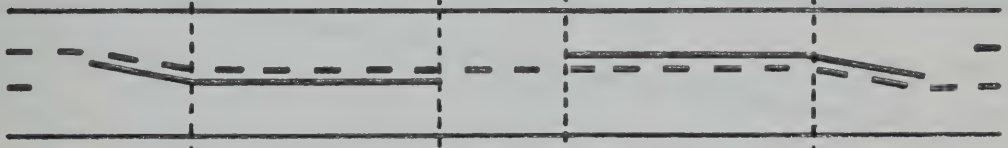

Fig. 6

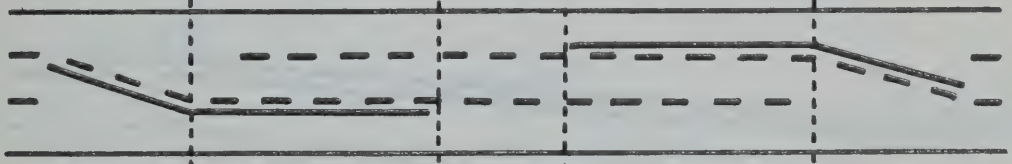

Fig. 6a

Fig. 4, 5, 6, 6a. Working traffic lines when sight distances from opposite directions overlap

Fig. 7 Design of lines on a curve with restricted sight distance on a two-lane road

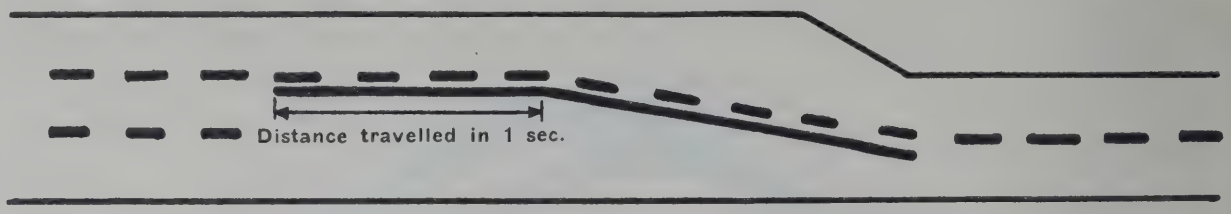

Fig. 8

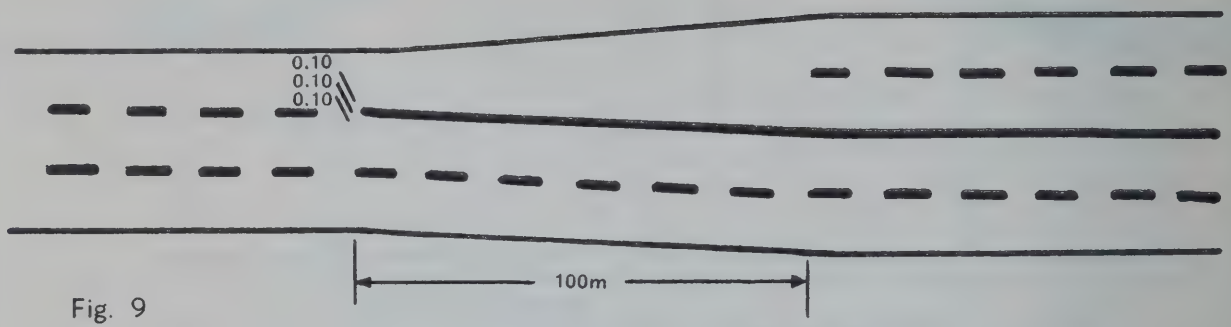

Fig. 9

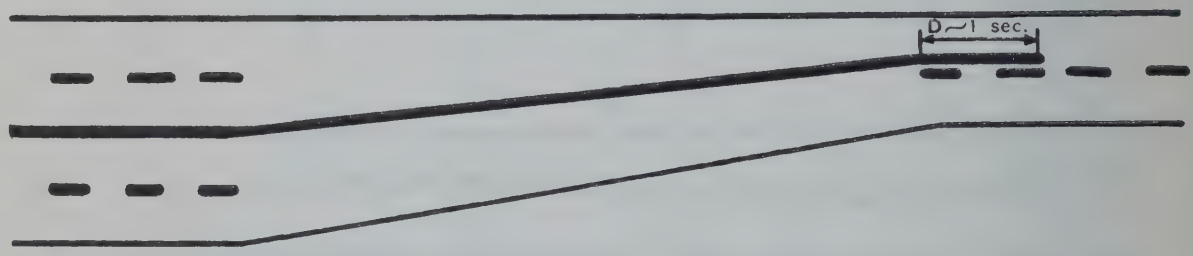

Fig. 10

Fig. 10a

Fig. 8, 9, 10, 10a. Methods of indicating changes in the width of the roadway

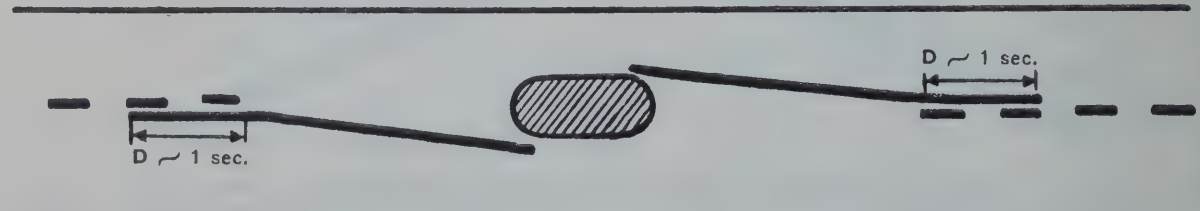

Fig. 11

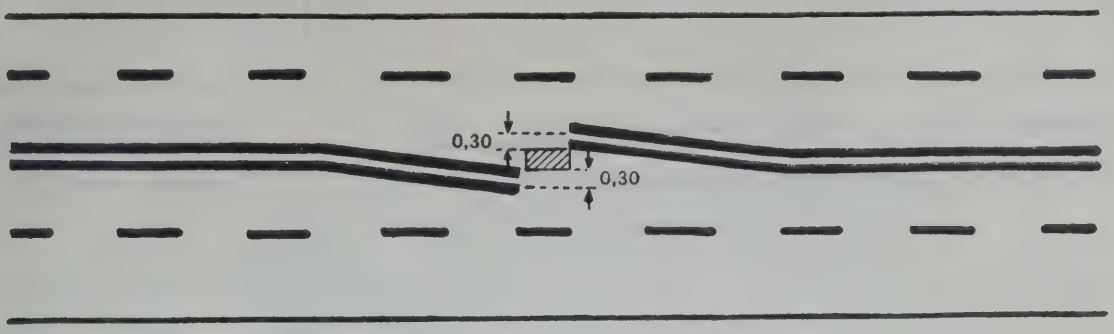

Fig. 12

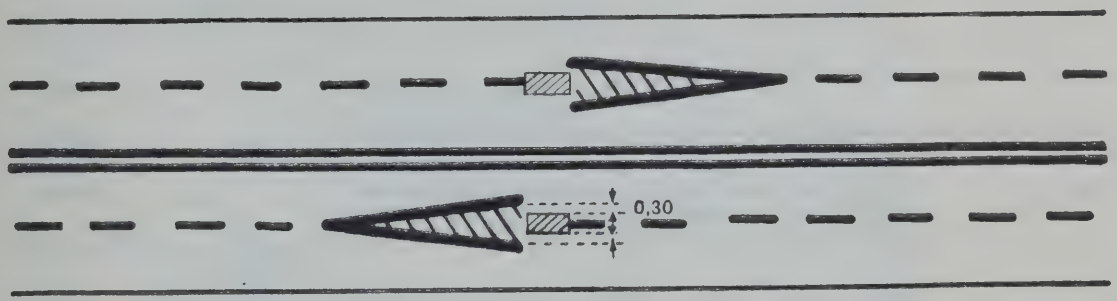

Fig. 13

Fig. 11, 12, 13. Lines indicating the approach to islands or obstacles on the roadway

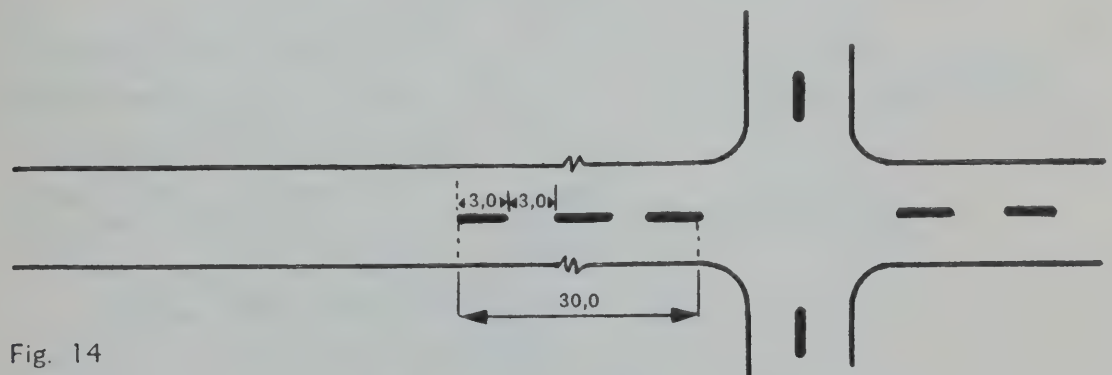

Fig. 14

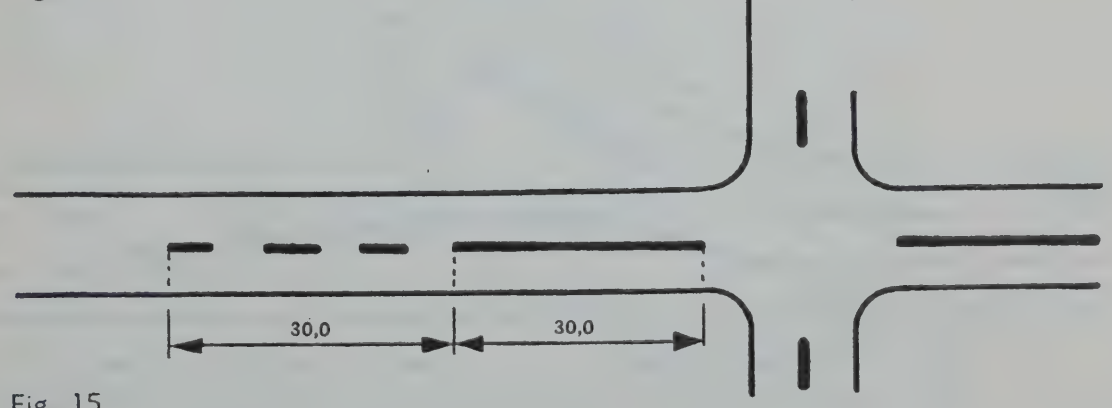

Fig. 15

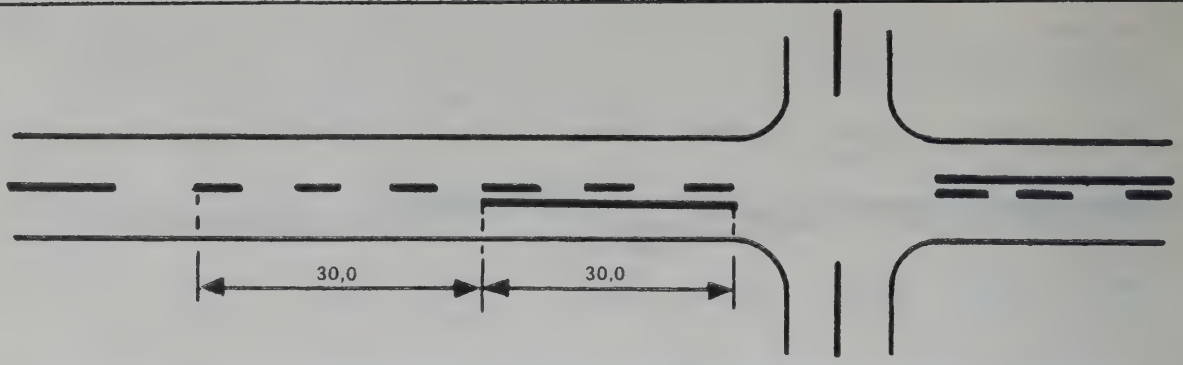

Fig. 16

Fig. 14, 15, 16. Use of continuous lines at intersections for improving traffic

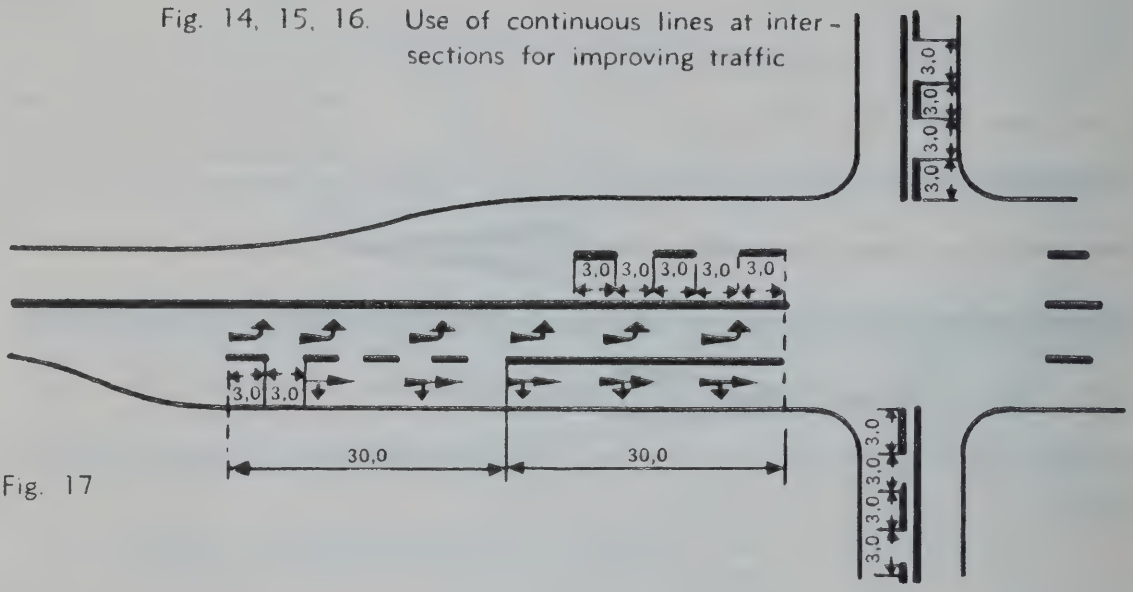

Fig. 17

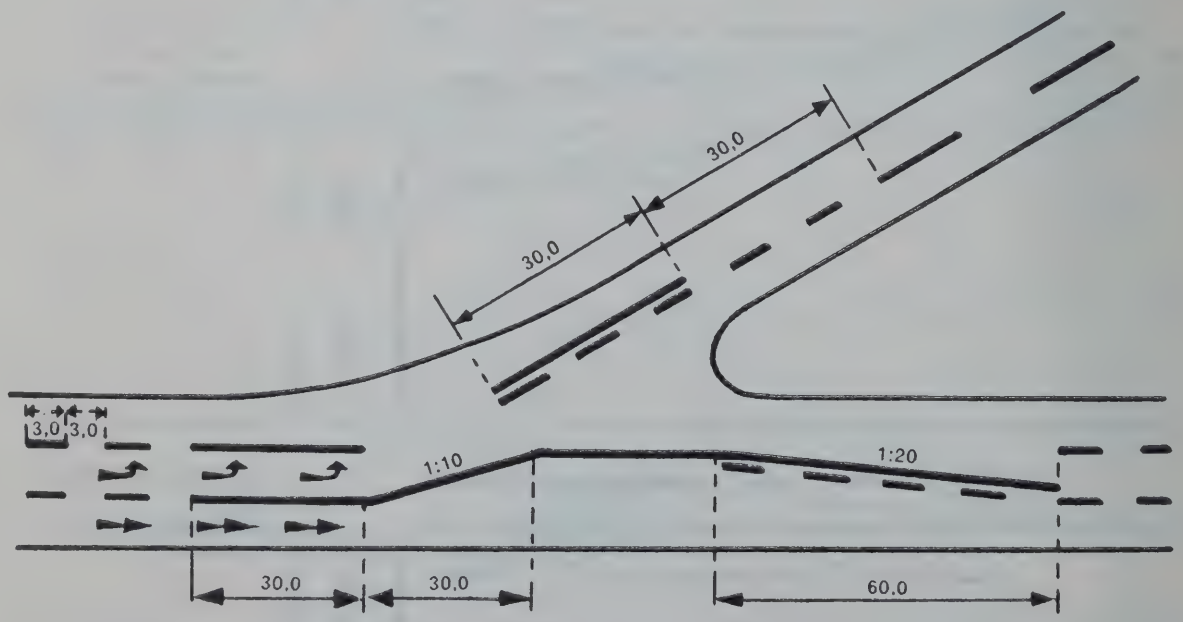

Fig. 17, 18. Arrow markings showing traffic approaching an intersection

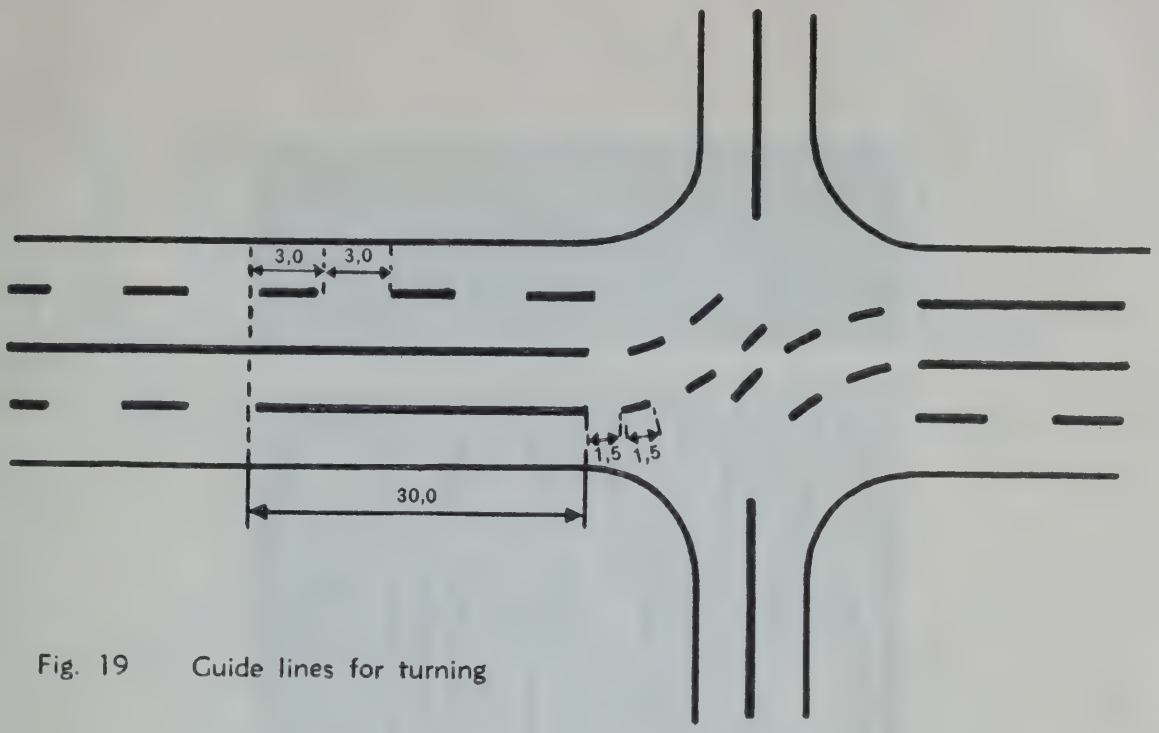

Fig. 19 Guide lines for turning

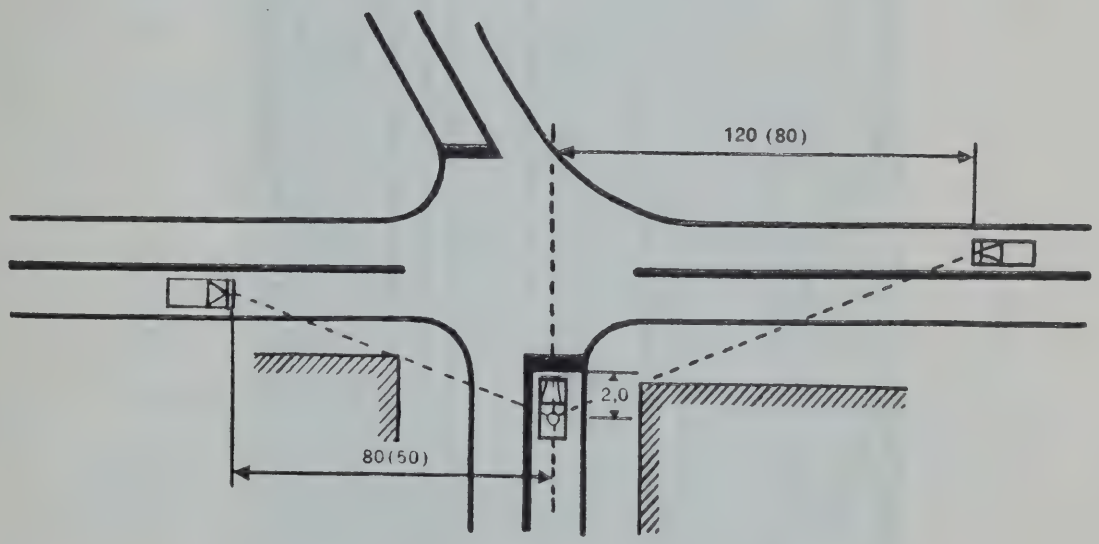

Fig. 20 Continuous longitudinal lines marking traffic lanes

NOTE: In sketches No. 14 to 20 the figures given for dimensions of dotted lines and intervals should be regarded only as mere indications

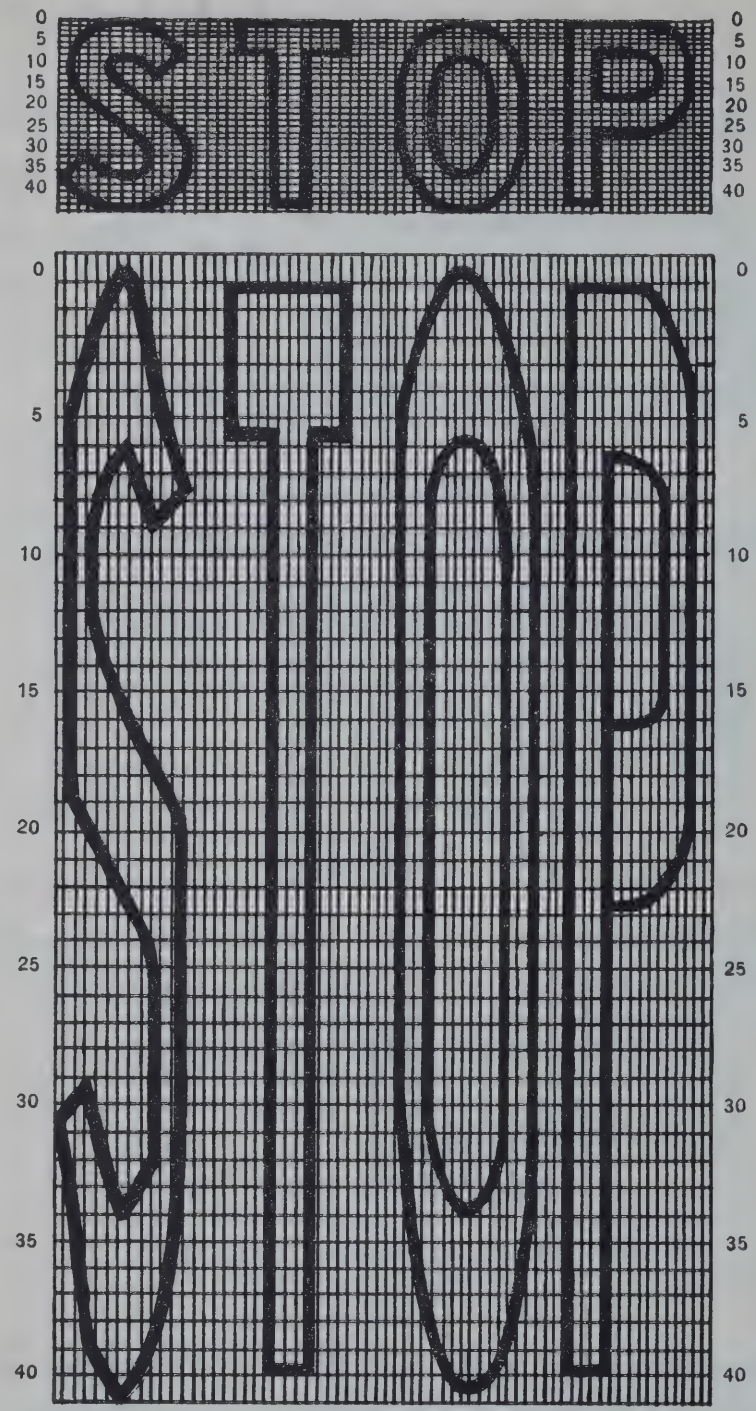

Fig. 22. Word markings on road surface for "stop" indication

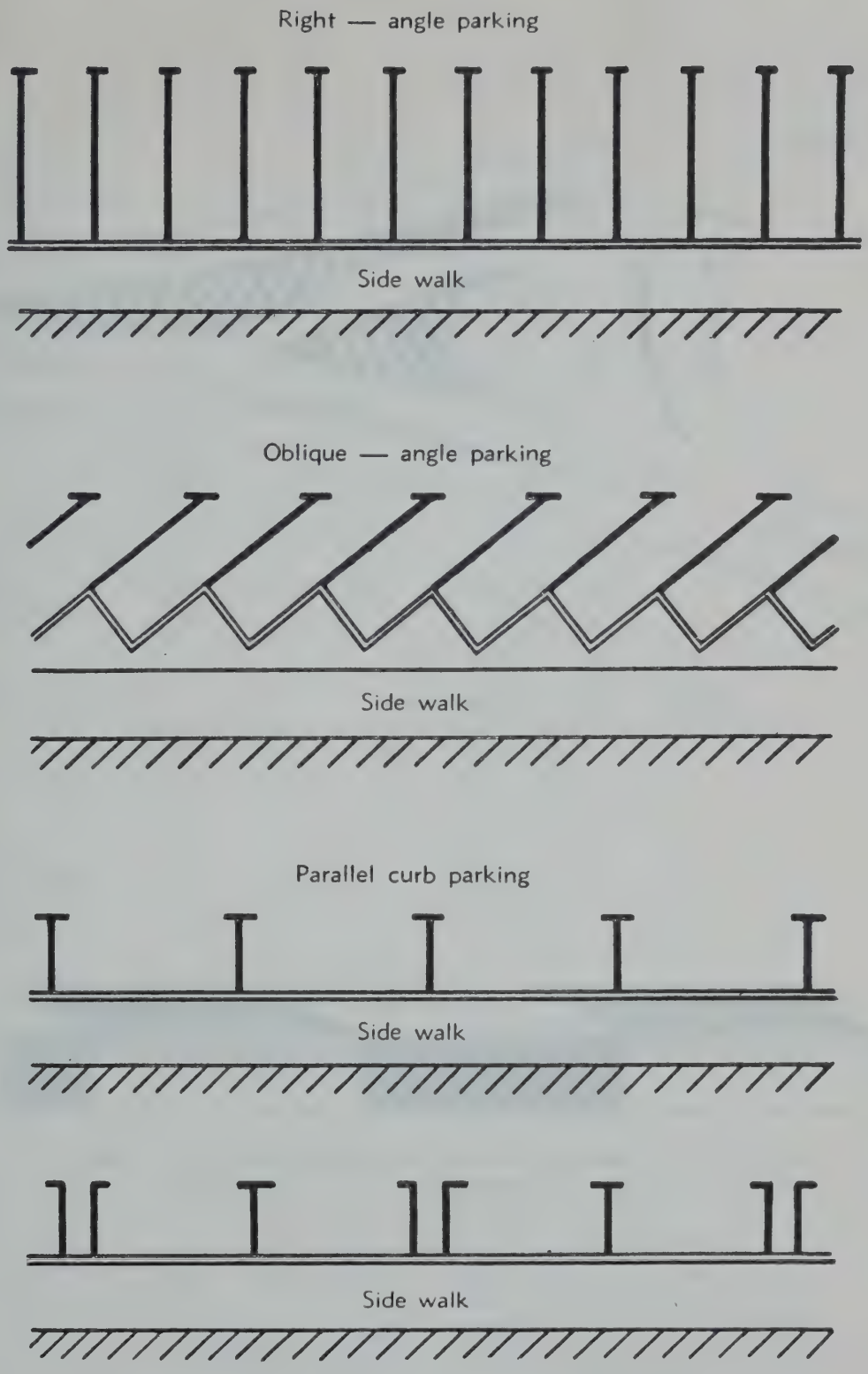

Fig. 23 Lines indicating parking space limits

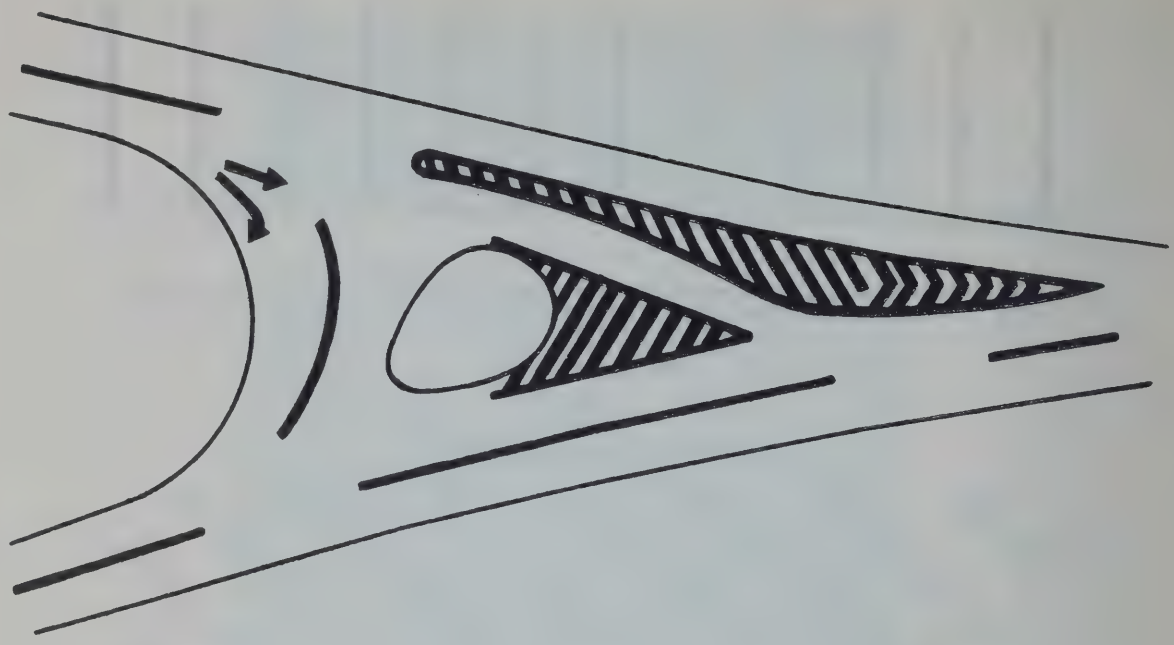

Fig. 21. Oblique parallel line markings

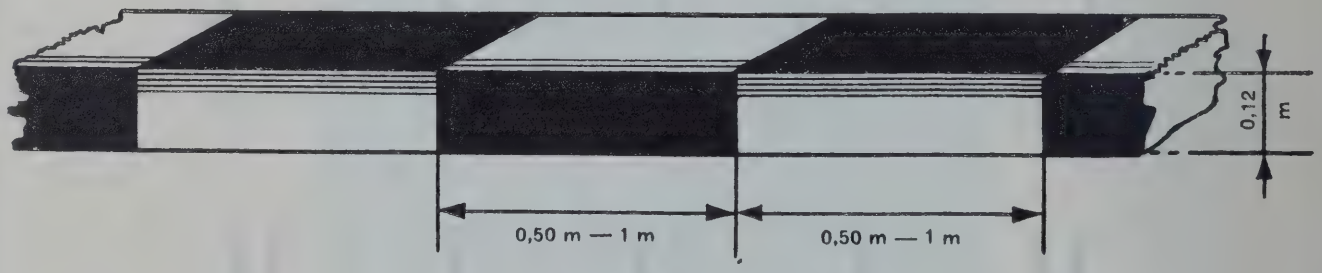

Fig 24. Kerb markings

Annex VII

Japan: Estimated operating costs of trucks, buses and passenger cars

A. Cost of operating a large diesel truck [a]

Expense item and unit	Type of roadway and average speed (kilometres per hour) Unimproved; 15	Improved; 25	Paved; 45
Depreciation of vehicle:			
Average travel distance (kilometres per day)	60	80	110
Effective rate (percentage)	80	80	85
Number of working days per year	294	294	310
Travel distance (kilometres per year)	17,600	23,500	34,100
Travel durability (kilometres)	150,000	200,000	300,000
Number of years for depreciation	8.5	8.5	8.8
Interest (yen)	1,152,000	1,152,000	1,206,000
Total depreciation (yen)	2,952,000	2,952,000	3,006,000
Average depreciation (yen per year)	347,000	347,000	342,000
Depreciation (yen per kilometre)	19.70	14.76	10.02
Cost of maintenance and repairs:			
Maintenance and repairs (yen per year)	150,000	140,000	120,000
Maintenance and repairs (yen per kilometre)	8.53	5.95	3.52
Fuel cost:			
Fuel consumed (litres per kilometre)	0.270	0.247	0.193
Fuel cost (yen per kilometre)	5.40	4.94	3.86
Oil cost:			
Oil consumed (litres per kilometre)	0.01	0.01	0.01
Oil cost (yen per kilometre)	0.40	0.40	0.40
Cost of tires and tubes:			
Travel distance (kilometres)	20,000	24,000	40,000
Cost (yen per kilometre)	7.50	6.25	3.75
Personnel and other expenses:			
Office expense (yen per day)	1,500	1,500	1,500
Office expense (yen per kilometre)	25.00	18.75	13.62
Total cost of operation (yen per kilometre)	66.53	51.05	35.17

[a] Average original cost of vehicle, 1.8 million yen.

B. Cost of operating a bus (petrol) [b]

Expense item and unit	Type of roadway and average speed (kilometres per hour) Unimproved; 15	Improved; 25	Paved; 45
Depreciation of vehicle:			
Average travel distance (kilometres per day)	80	100	140
Effective rate (percentage)	80	80	85
Number of working days per year	294	294	310
Travel distance (kilometres per year)	23,500	29,400	43,400
Travel durability (kilometres)	150,000	200,000	300,000
Number of years for depreciation	6.4	6.8	6.9
Interest (yen)	1,035,000	1,111,000	1,134,000
Total depreciation (yen)	3,335,000	3,411,000	3,434,000
Average depreciation (yen per year)	521,000	502,000	498,000
Depreciation (yen per kilometre)	22.20	17.10	11.42
Cost of maintenance and repairs:			
Maintenance and repairs (yen per year)	180,000	150,000	120,000
Maintenance and repairs (yen per kilometre)	7.65	5.11	2.76
Fuel cost:			
Fuel consumed (litres per kilometre)	0.320	0.284	0.214
Fuel cost (yen per kilometre)	10.56	9.37	7.06
Oil cost:			
Oil consumed (litres per kilometre)	0.015	0.015	0.015
Oil cost (yen per kilometre)	0.60	0.60	0.60
Cost of tires and tubes:			
Travel distance (kilometres)	20,000	24,000	40,000
Cost (yen per kilometre)	7.50	6.25	3.75
Personnel and other expenses:			
Office expense (yen per day)	1,800	1,800	1,800
Office expense (yen per kilometre)	22.50	18.00	12.86
Total cost of operation (yen per kilometre)	71.01	56.43	38.45

[b] Average original cost of vehicle, 2.8 million yen.

C. Cost of operating a passenger car [c]

Expense item and unit	Type of roadway and average speed (kilometres per hour) Unimproved; 25	Improved; 35	Paved; 55
Depreciation of vehicle:			
Average travel distance (kilometres per day)	80	100	150
Effective rate (percentage)	80	80	85
Number of working days per year	294	294	310
Travel distance (kilometres per year)	23,500	29,400	46,500
Travel durability (kilometres)	200,000	220,000	300,000
Number of years for depreciation	8.5	7.5	6.5
Interest (yen)	960,000	819,000	690,000
Total depreciation (yen)	2,460,000	2,319,000	2,190,000
Average depreciation (yen per year)	289,000	309,000	337,000
Depreciation (yen per kilometre)	12.30	10.52	7.24
Cost of maintenance and repairs:			
Maintenance and repairs (yen per year)	250,000	220,000	150,000
Maintenance and repairs (yen per kilometre)	10.63	7.49	3.23
Fuel cost:			
Fuel consumed (litres per kilometre)	0.185	0.153	0.123
Fuel cost (yen per kilometre)	6.11	5.05	4.06
Oil cost:			
Oil consumed (litres per kilometre)	0.005	0.005	0.005
Oil cost (yen per kilometre)	0.20	0.20	0.20
Cost of tires and tubes:			
Travel durability distance (kilometres)	25,000	30,000	40,000
Cost (yen per kilometre)	2.56	2.13	1.60
Personnel and other expenses:			
Office expense (yen per day)	1,400	1,400	1,400
Office expense (yen per kilometre)	17.50	14.00	9.33
Total cost of operation (yen per kilometre)	49.30	39.39	25.66

Source: Government of Japan, *Engineering and Traffic Aspects of Highway Safety* (February 1957), pp. 102-104.

[c] Average original cost of vehicle, 1.5 million yen.

Annex VIII

Japan: Benefits to vehicle passengers through saving in time[a]

The value of road improvement in time saving to passengers is very hard to estimate because it differs widely according to persons and circumstances. By assuming that only a part of the saved time is usefully occupied, and by estimating the value of the unit of time at a conservative rate, an attempt has been made to avoid overestimating the benefits.

The value of benefits to vehicle passengers through saving in time has been estimated as follows. If the average monthly income per person is expressed by I (yen), on the assumption that the average man works 8 hours a day, 25 days a month, the value per minute (m) is:

$$m = \frac{I}{12{,}000} \text{ yen per person-minute}$$

If the average travelling speeds of vehicles on a section before and after the road improvement are expressed by V (kilometres per hour) and V_o (kilometres per hour), respectively, the time saved per kilometre (t) is:

$$t = 60 \left(\frac{1}{V} - \frac{1}{V_o}\right) \text{ minutes}$$

If n per cent of the time saved is usefully occupied, and p is the number of passengers travelling on the route annually (person-kilometres), the benefit of the saving in time (B) is:

$$B = \frac{n}{100} mtp = \frac{nIp}{20{,}000}\left(\frac{1}{V} - \frac{1}{V_o}\right) \text{ yen}$$

According to an economic survey of the projected National Highway No. 18, the estimated benefits to passengers on passenger vehicles and buses in 1960 were as follows: (assuming I=12,000 yen, n=50 per cent).

	Passenger vehicles	Buses	Total
Annual passenger travel (thousands of person-kilometres)	11,470	127,720	139,190
Benefits through saving in time (thousands of yen)	3,190	27,510	30,700

[a] Government of Japan, "Engineering and Traffic Aspects of Highway Safety" (February 1957) pp. 105-107.

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